AUTOMOTIVE INDUSTRIES

VOLUME 59 *Philadelphia, Saturday, December 22, 1928* NUMBER 25

Automotive Buying *Gives* Steel *Industry* Record Year

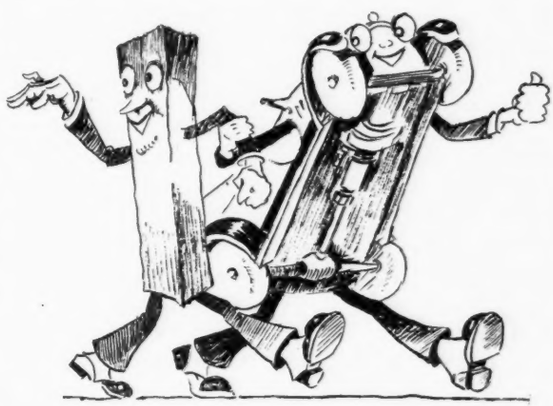
New high marks set in sheet and ingot output with car and parts factories consuming 18 to 20 per cent of total production. Trend of prices is upward.

By William Crawford Hirsch

ARM in arm, the steel and automotive industries, in 1928, stepped out of the preceding year's listless condition and established new high records of production.

Measured in terms of theoretical ingot output, 1928 steel production is assumed to have set a new high mark of 50,000,000 tons, an increase of 14 per cent over 1927 and of 7 per cent over 1926. Taking as a criterion sheets, in the consumption of which the automotive industry is the dominant factor, 1928 production is estimated to have run close to 5,000,000 tons as compared with 4,000,000 tons in 1927.

From whatever angle the 1928 steel record is analyzed, it is found that the major influence was the sharp increase in automotive demand, and so it is little wonder that when the buying avalanche from parts makers and motor car manufacturers descended with full force upon the market, statisticians conceded to the automotive industry a possible 18 to 20 per cent consumption of the total steel production, as against 14 or 15 per cent in the preceding year. It was pointed out that current models called for more steel per unit, but with this explanation was paired the comment, highly complimentary to the automotive engineer, that a ton of steel was being made to do much more work than it had in the past and that, therefore, a ton of steel in 1928 went much farther than it did a few years ago.



Arm in arm, the steel and automotive industries have established new production records

Keeping step with the automotive industry in point of output, steel manufacturers, in 1928, succeeded in gaining a lap in the matter of prices. In justice to the steel industry three points must be considered in passing judgment on what price advances have taken place. First, some descriptions of finished steel did not yield a reasonable profit margin previous to the advance. Second, what advances have taken place have been very moderate and more or less gradual. Third, a commendable spirit of consideration was shown for parts makers who had committed themselves on the basis of lower steel prices, as they were extended protection against losses by steel producers. On the other hand, the ready acquiescence of leading automotive consumers when the sheet mills on Oct. 1 lowered their cash discount from 2 to ½ per cent over the protest of many jobbers, demonstrates that the fair play basis of the relations between steel mills and automotive consumers rests on reciprocity.

In spite of the fact that the sales policy of the manufacturers of low-priced passenger cars, whose steel consumption furnishes the real tonnage sustenance to the sheet and strip-steel mills, hardly permits of even the thought at this time of passing higher material costs on to the car buyer, advances in steel prices so far promulgated have been absorbed without resistance. What worries automotive consumers is the steel market's trend. Talk of higher and higher prices has been the outstanding feature of the steel market during the year's closing months, and what consumers are uneasy about is how much of this talk is just market babble and how much of it voices the opinion of the steel industry's leaders with reference to their price program.

A strong case might be made out on paper for the

argument that the imposing mechanical improvements that have been made in steel mills should result in lower rather than higher prices. It has been stated by competent authorities that not less than $75,000,000 has been expended in the last two years in improving the process of sheet-rolling alone. This is a conspicuous instance of the enormous sums which the steel industry had added in recent years to plant investment, either by plowing back the profits of former years or by new financing. This argument loses sight of the tremendous pressure of obsolescence of equipment on profits. Progress is so rapid that a costly piece of mill equipment may become obsolescent or at least uninviting from a profit standpoint before its installation has been completed.

Immediate Charges to be Met

Granted that ultimately costs will be greatly lowered through these expensive mechanical short-cuts in production methods, obsolescence and experimentation charges must be met now, and must, in part at least, be borne by the consumer, say the steel men.

The long and short of this situation, from the steel industry's viewpoint, is that, had it not been for the coming of the continuous mills and the improvements made in pickling, annealing and cold-rolling, the recent bulge in demand would have seen much higher sheet and strip prices, with premiums freely paid for prompt shipment. Undoubtedly there is a comfortable margin of steel mill capacity over 1929 requirements, even if these, as it is hoped, should prove to exceed those of 1928, but this excess of capacity over probable demand, it is held, must be looked upon rather as a margin of safety than one that, because of the competitive striving for orders, will tend to work in buyers' favor in the matter of price. In its very nature, the steel industry must build several years ahead and always keep its capacity above the need of the hour. It would be manifestly unfair, almost everyone agrees, to penalize it for this foresightedness.

The course of 1928 steel prices may be outlined briefly by stating that a price advance essayed early in the year by sheet-rollers never became fully operative. Attempts to maintain automobile body stock at 4.15 cents, Pittsburgh, came to grief in April when the 4.00 cents price that had previously prevailed was restored and continued until November, when a $2 per ton advance on all descriptions of sheets was announced for first quarter 1929, and the advance on body stock appears to have become immediately effective on current new business.

Black sheets, which in June had dipped to 2.65 cents, Pittsburgh, rose $2.00 a ton in September. This with the recent $2.00 per ton advance for first quarter 1929 brings the asking price to 2.85 cents, Pittsburgh. Blue annealed, held throughout the year at 2.00 cents, Pittsburgh, is quoted at 2.10 cents for first quarter 1929. In an effort to eliminate the ragged condition in the strip-steel market, producers brought out a new list of extras for hot-rolled in October. Prices for narrow strip were increased and those for wider material lowered. A base price on width under 6 in. of 2.00 cents and of 1.90 cents, Pittsburgh, on 6 to 24-in. strip was announced and continued in effect for first quarter 1929 business.

Because of the jumbled condition of the market in the earlier part of the year, it is difficult to make accurate comparisons, but the new prices represent decided gains over the year's average billings. Producers of cold-rolled strip also changed their method of quoting prices, announcing in September that base prices would henceforth apply to lots of 6000 lb. of one size and temper for shipment at one time with $5.00 a ton extra for smaller lots. Up to then the market had been quoted the other way, the base price applying to 2000 to 5999 lb., with $5.00 per ton discount on larger lots.

The market closed the year at 2.85 @ 2.95 cents, Pittsburgh and Cleveland. Hot-rolled steel bars could be bought during the first quarter of 1928 at 1.80 cents, Pittsburgh. Dollar by dollar per ton, the mills worked the price higher, until at the year's close the market is at 1.90 @ 1.95 cents. Pittsburgh.

Producers of cold-finished steel bars quoted their product at 2.20 cents, Pittsburgh, based on a 1.90 cents hot-rolled market, and for a time sought to avoid 1929 commitments until they had been assured of a continuance of that price level for their semi-finished material. Automotive alloy steel manufacturers announced in November a base price of 2.65 cents, mill, for large buyers and of 2.75 cents, mill, for smaller consumers, to apply on all first quarter 1929 business. There resulted considerable lack of uniformity in the market from the previously customary method of quoting each S.A.E. steel flat, and to remedy this state of affairs a base price with added alloy differentials has been adopted. Compared with other steel products, the market for automotive alloy steels may be said to have ruled steady throughout the year.

Pig-Iron Market

Just as automotive demand is written all over the steel market's recovery in 1928, so it was buying by automotive foundries that furnished the momentum which enabled the pig-iron market to stage during the final quarter of 1928 a boom that resulted in sharp advances. The curtain opened on the Michigan price at $17.50, furnace, and before Thanksgiving $20.00 was the going base quotation. No. 2 foundry opened the year at $17.25, Valley, shed 75 cents during the summer months, and recovered in October, with the quotation at the beginning of December $17.50 @ $18.00. The premium on malleable over foundry rose from 25 cents at the beginning of the year to 50 cents toward its close.

Blast furnaces enjoyed the first real spell of prosperity in some time during the latter part of the year, and every available ton of ore was rushed from the Upper Lakes to blast furnace territory before the close of navigation should hinder the move-

ment. Announcement on Nov. 22, that the Secretary of the Treasury had lifted the anti-dumping order against pig iron from Germany, in effect since 1926, acted somewhat as a damper on the market, but foreign producers, well aware of the fact that a general making-over of the tariff is scheduled for 1929, are likely to go very slow in engendering fresh animosity in the American market at this time.

Copper Price Higher

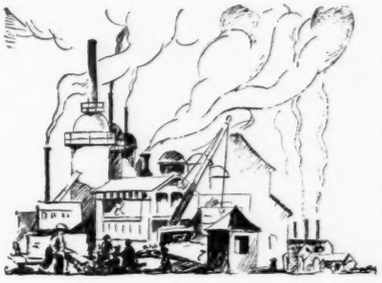
Copper producers started the year with sales of electrolytic at 14 cents, delivered Connecticut, and 14⅛ cents, delivered Middle West. In May heavy domestic and foreign demand justified an advance of ½ cent, followed by a further ½ cent rise in September. In October home consumers took on approximately 100,000 net tons, with the result that prices were marked up to 16 @ 16¼ cents. Finished copper, brass, bronze and nickel-silver products moved higher in conformity with the price of the basic metal. The producers point to the metal's statistical position and to buyers frequently falling over one another in their scramble for metal as explanation for the sharp rise in prices, and there are those who honestly believe that producers' interests would be no less served than those of consumers if the market were held in check from now on. They fear that further advances might cause the carefully reared organization of the industry to weaken under clandestine overproduction. There are other producers, however, who believe that much higher price levels are justified, and are carrying on active propaganda to that end. Rumor has it that the leading interest, which greatly added to its integrated strength in 1928 through the acquisition of additional fabricating plants, will before long be opposed by a similarly integrated organization to be brought about by the amalgamation of other important smelting, refining and fabricating interests.

With automotive consumption of copper in 1928 estimated to have approximated 120,000 net tons, it will be seen that a change of half a cent in the market involves more than a million dollars either in added costs or savings to the automotive industry, so that nowhere will copper market developments be more closely followed than in the automotive realm.

The aluminum market sailed on an even keel throughout 1928. Up to Dec. 1 the domestic producer had announced no price changes, and in the outside market 98 @ 99 per cent virgin metal sold uniformly at 23.90 cents. With his large Canadian and Norwegian plants, the sole American producer has really become the dominant international factor, although more or less of a balance of power is supposed to be maintained between him and the European Cartel. The latter, made up of manufacturers of different nationalities, lacks the permanent unity of policy of the American producer. World production at the present time is assumed to approximate 225,000 metric tons a year.

In Germany there is much agitation for lower aluminum prices as a means of evading the use of much high-priced American copper. While the use of aluminum in automobile engine pistons increased in 1928, it is to the field of aircraft construction that the aluminum industry looks for a really worth-while addition to its outlet. Here duralumin, aluminum sheets, bars and tubing, aluminum and aluminum-magnesium castings, etc., find employment in steadily increasing quantities. A point not to be lost sight of in appraising the aluminum market's future course is whether there will be any change in the rates of duty on aluminum when general revision of the tariff is undertaken.

Automotive consumption of nickel in the form of nickel-steels, as well as in the trimmings of higher-priced motor cars and in accessories, underwent expansion in 1928. The price for ingot metal ruled uniformly at 35 cents throughout 1928. Strengthening of the financial structure of the leading producer will very likely result in greater energy both on the production and marketing end, but unlike other metals, nickel smelting and refining involves costly processes in which opportunities for economies have been almost exhausted.



Tin had more ups and downs in 1928 than any other metal. Starting the year at 55½ cents, the market displayed progressive weakness, until in June, aided by considerable bear manipulations, Straits tin was offered at as low as 45 cents. Gradual recovery set in, and at the beginning of December the market had recovered to 53 cents. Establishment of the National Metal Exchange in New York, on which tin futures will be the sole object of trading, introduces into the tin market a new speculative element, consumers anxiously awaiting the direct influence of this innovation on their tin bills.

Storage battery manufacturers faced relatively favorable conditions in the lead market in 1928. The market ruled well under the average price of the preceding year, chiefly as the result of low prices on the London Metal Exchange. In March, lead sold at as low as 5.75 cents, St. Louis. Early in December the market ruled at 6.20 cents. Lead producers have followed the example of the copper and zinc producers, and organized the Leads Industries Association, from which it may be deduced that they are bent upon improving the profitability of their industry.

Following very low market prices during the first half of 1928, the zinc market was lifted to 6.25 cents, St. Louis, in midsummer, and later to 6.30 @ 6.35 cents. Producers are in absolute control of the situation, but they pursue a very conservative course, portending still greater stabilization of the market in 1929.

A NEW type of upholstery fabric has recently been developed by DuPont Rayon Co., working in conjunction with textile makers, which was first shown to the public in New York during the week of the Automobile Salon and samples of which were to be found on some of the cars exhibited there.

The new material is a combination of rayon with textile fabrics in such a way that most unusual designs, brilliancy and richness can be obtained, with ease in keeping the material clean. In addition to use for ordinary upholstery, the new material is being made up as slip covers by means of which the upholstery of a car may be entirely changed in a very few minutes to harmonize with milady's gown, with the formal note required for evening use or with the changing moods of the owner's taste.

These new fabrics are available in a wide range of designs from very conservative materials to designs which fully express the most modernistic tendencies in art. Flat fabrics have been concentrated on, although rayon velours and velvets are also available.

Automotive Industries
December 22, 1928

Advantages *of* Diesel-Engine Pictured

Ignition and carburetor troubles are practically eliminated. Danger of fire reduced. Fuel cost lower.

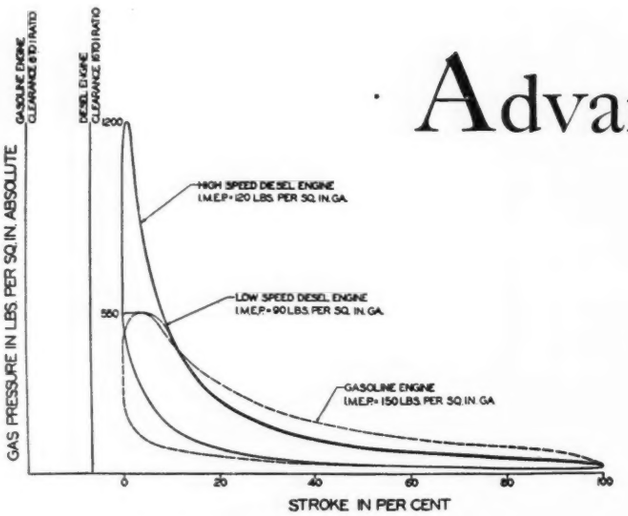


Fig. 1—Typical indicator diagrams

THE Diesel cycle has been employed for more than a quarter of a century in internal combustion engines used for stationary powerplants of various descriptions, and for marine propulsion service, and these engines have been designed to obtain the theoretical ideal shape of indicator diagram such as shown on the chart as representing the performance of a low-speed Diesel engine.

It is perhaps not generally recognized that the Diesel engine operating on the constant pressure cycle is limited by that very restriction to comparatively low-speed operation. All combustion phenomena taking place in internal combustion engine operation require a definite time for their completion. Now it is perfectly obvious that any engine suitable for aircraft propulsion must be of the high-speed type. It must operate at speeds in excess of 1400 or 1500 r.p.m. in order to begin to compete with existing aircraft powerplants. Granting then that a practicable Diesel aircraft engine must run at speeds five or six times as fast as the stationary or marine type of Diesel powerplants, whereas the ignition time lag is substantially the same in either case, it can be readily seen that the high-speed engine demands a different type of combustion than the low-speed Diesel.

Fuel injection in the high-speed Diesel must start as early as 50 deg. before top dead center in order to insure complete and smokeless combustion, whereas in the low-speed Diesel fuel injection usually starts about 10 deg. before top dead center and continues until about 32 deg. past top dead center.

Now in the case of the high-speed Diesel, when ignition starts considerably ahead of top dead center, the cycle of operation does not materially differ from that of the gasoline or explosion engine, the spark of which is timed to occur at substantially the same point in the piston stroke that the fuel injection of the high-speed Diesel is timed to start. There is, of course, this important difference that when the spark takes place in the gasoline engine all of the fuel charge is contained in the cylinder, whereas when ignition starts in the high-speed Diesel engine only a small percentage of the fuel charge has already been injected. This latter condition enables the designer to control the pressure rise within the cylinder within certain limits.

Admitting then that combustion in the high-speed Diesel engine must start considerably ahead of top dead center and must continue while the combustion space becomes reduced in volume more and more as the piston approaches top dead center, it must be expected that cylinder pressures will rise more in accordance with the diagram obtained from the conventional explosion engine rather than in the manner attributed to the low-speed Diesel of true constant pressure type. This then accounts for the shape of the indicator diagram entitled "High-Speed Diesel Engine" in Fig. 1.

Now since the high-speed compression-ignition solid fuel injection aircraft engine referred to throughout this paper is termed a Diesel engine, an explanation might be in order to satisfy the criticisms of those who strenuously oppose the use of the term "Diesel" as applied to engines which do not operate on the true constant pressure cycle.

Credit Belongs to Diesel

Authorities the world over have sought to differentiate between the Diesel cycle and the so-called dual or mixed combustion cycle or Sabathe cycle in which the fuel is burned partly at constant volume and partly at constant pressure.

Although the distinction between the two cycles is undoubtedly an important one from a thermodynamic standpoint and also from a structural standpoint, considering the increased stresses brought about by the mixed cycle, still I consider that Dr. Diesel laid the ground work for both types and this achievement should always stand to his credit. The fact that at higher speeds combustion must proceed in a somewhat different manner than he originally contemplated does not seem to alter the case since no basically new mechanisms have been added to his original engine to accomplish this result. It has been more a matter of great refinement in detail.

Incidentally, it is interesting to note that, as numerous authorities have pointed out, an improved thermal efficiency results from the use of the mixed cycle rather than the original Diesel constant pressure cycle, and this fact is perhaps best brought out in a chart in a paper by O. D. Treiber (Fig. 2), which shows graphically the relations between both indicated mean effective pressures and thermal efficiency on the one hand, and various proportions of constant volume and constant pressure combustion on the other hand.

The high efficiency of the mixed cycle has also been proved in a practical fashion by specific fuel consumption readings as low as 0.35 lb. per brake horsepower per hour which have been obtained both by British experimenters and Dr. Dorner with the writer.

*From a paper presented at S.A.E. Aeronautical Meeting, Chicago.

Type Aircraft *from* Tests

By Capt. L. M. Woolson *
Aeronautical and Research Engineer, Packard Motor Car Co.

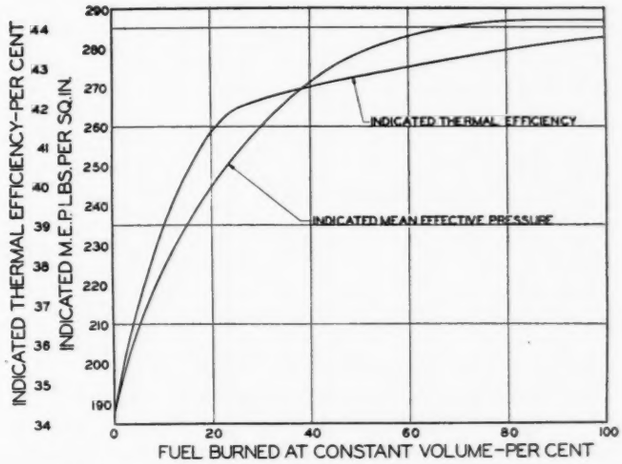

INDICATED THERMAL EFFICIENCY-PER CENT
INDICATED M.E.P. LBS. PER SQ. IN.
INDICATED THERMAL EFFICIENCY
INDICATED MEAN EFFECTIVE PRESSURE
FUEL BURNED AT CONSTANT VOLUME-PER CENT

Fig. 2—Effect of constant-volume combustion on engine efficiency (according to Treiber)

It has been assumed in many quarters that the high maximum cylinder pressures encountered with the high speed Diesel principle militated against sufficiently light engine construction to permit its usage for aircraft powerplants. That this fear is unfounded is perhaps best proved by the fact that the Packard Diesel aircraft engine, weighing less than 3 lb. per horsepower, has been subjected to considerable flight testing as well as several hundred hours of ground testing, and a construction has been evolved which is fully capable of withstanding cylinder pressures well in excess of 1200 lb. per sq. in. without having recourse to excessively heavy construction.

Departures from conventional aircraft engine design were, of course, required in many instances, but in general the result has been achieved by utilizing materials of the kind best suited to cope with the respective stresses and proportioning the structure in a manner calculated to secure maximum strength with minimum weight. As a typical example, it has been necessary to forego the use of the light cast alloys where subjected to alternating stresses, due to the low impact value of such material.

Passing now on to some of the attractive aspects of the Diesel aircraft engine, those of its characteristics which relate to reliability are perhaps of the most interest at the present time, when safety and dependability are the two major requirement in the progress of aircraft engine development. Compared with gasoline engines on the basis of reliability, the Diesel engine scores heavily in respect to the two most important accessories of the internal combustion engines, namely, ignition and carburetion or fuel injection systems.

Considering first the question of ignition reliability, in a nine-cylinder radial engine, there are necessitated two independent sources of ignition current whether of the battery or magneto type, two drives for these systems, 18 high tension wires, 18 spark plugs and an ignition switch, comprising an aggregate of perhaps 1000 individual parts. The Diesel engine ignition is furnished solely by the compression of the air charge and necessitates merely a smaller clearance volume in the cylinder as compared with the gasoline engine. No additional parts of any kind are required and continuous ignition is assured just as long as the engine is operating, whether it be for 1 hour or 1000 hours. Furthermore, the ignition system of each cylinder is entirely independent of that of the others so that the nine-cylinder radial Diesel can be said to have nine individual ignition systems, whereas the gasoline engine of similar type is dependent upon the functioning of two independent systems, each comprising a great many frail parts subject to failure, not forgetting the possibility of the spark plugs failing to function due to the presence of carbon or oil on their surface.

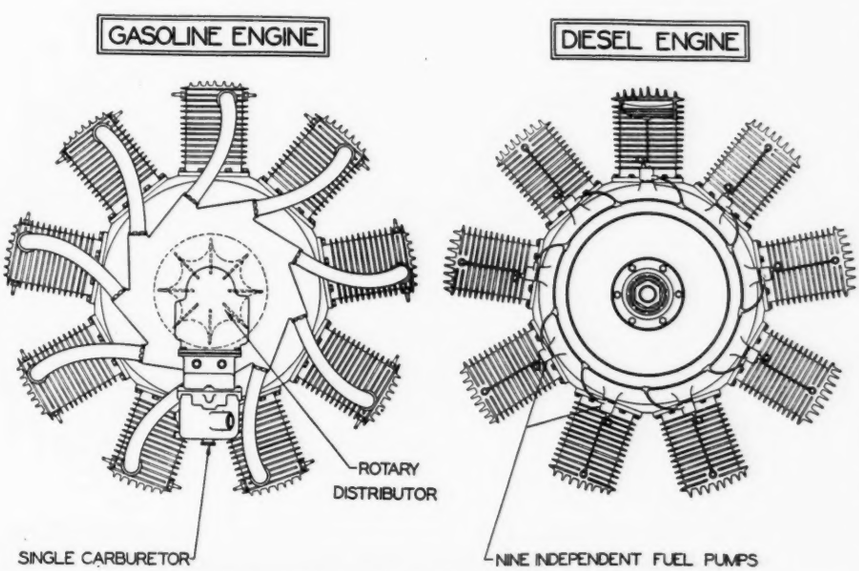


Fig. 3—Comparison of fuel-feeding systems

Comparing the two types of engines now from the standpoint of fuel charge supply, Fig. 3 illustrates the next important advantage of the Diesel engine in that each cylinder is furnished with an individual injection system, whereas the conventional nine-cylinder gasoline aircraft engine is dependent either on a single carburetor or on a triple-barrel carburetor. In the case of the single carburetor installation, this is usually complicated still further by the need for a rotary distributor of some kind or a low pressure supercharger intended to improve the

distribution of the mixture to the various cylinders, a rather difficult feat to carry out unaided with a single carburetor. However, even with the three-barrel carburetor there are at best three independent

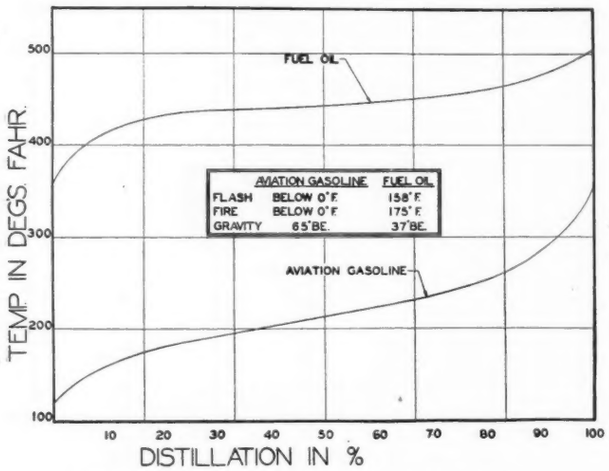


Fig. 4—Distillation curves of aviation gasoline and Diesel engine oil

carburetion systems, the failure of any one of which would result in the loss of one-third of the operating cylinders.

There still remain two outstanding advantages in favor of the Diesel for aircraft operation. The first of these relates to the reduction (if not total elimination) of the fire hazard common to all aircraft engines using gasoline as a fuel. Fig. 4 illustrates comparative distillation curves of a good grade of aviation gasoline and an acceptable grade of Diesel fuel oil. In addition there are presented on this chart the comparative flash and fire points of the two types of fuel and the greatly enhanced safety of the Diesel fuel oil is quite obvious from an inspection of these comparative figures.

Perhaps a more convincing proof of the decreased fire hazard of the Diesel engine can be furnished by citing actual experiences. In laboratory work incidental to the development of new types of gasoline aircraft engines, gasoline fires are more or less of daily occurrence. In the course of the period of laboratory work with the new Packard Diesel aircraft engine extending over a year there has not been a single fire. Naturally, there have been innumerable cases where fuel lines have leaked or even broken off, but at no time did a fire result even when the fuel was flowing a full stream over the heated engine.

Fire Almost Impossible

I believe that experience in this respect to date entitles me to make the statement that fire after a crash of an airplane equipped with a Diesel engine would be practically impossible and could only occur if the engine continued to run wide-open with fuel oil poured directly into the exhaust flame, an almost unbelievable contingency.

We now come to consider what has always been represented as the most important advantage of the Diesel aircraft engine, namely, economy in fuel consumption. I have purposely subordinated this question to those of safety and reliability, recognizing that at the present time these latter qualities are of far more importance to the healthy growth of the industry than are questions of economy. Once it has been proved that the Diesel engine excels in safety and reliability for aircraft use, then the clinching arguments in favor of its universal adoption will be found in its far superior fuel economy as compared with gasoline engines.

In actual aircraft engine operation over the range of cruising speeds we secure specific consumptions for gasoline and Diesel engines respectively, as are shown on Fig. 5. The curve shown as representing gasoline engine fuel consumption performance can be considered as almost the best obtainable using compression ratios suitable for operation with standard aviation gasoline. The Diesel engine consumption curve represents the average of a great many tests which have been checked by actual fuel consumption readings in the air. It might perhaps be stated at this point that compression ratios as high as 18 to 1 have been used in this Diesel aircraft engine development work, such ratios insuring prompt starting and satisfactory performance at altitudes represented by the ceiling of the Stinson-Detroiter plane used in these tests.

Fig. 6, taken from a recent paper by Col. J. G. Vincent entitled "Various Types of Internal Combustion Engines and Their Fuel Requirements," illustrates in a convincing fashion the tremendous savings in fuel cost when comparing the operation of a Diesel and a gasoline engine. The prices listed on this chart represent the quotations given recently in Detroit for delivery of the various types of fuels in tank car lots.

80 Per Cent Fuel Saving

With aviation gasoline at 19.8 cents per gallon and a specific fuel consumption of 0.52 lb. per b.hp.-hr., the gasoline engine costs for fuel 1.7 cents per b.hp.-hr. The Diesel engine corresponding cost is 0.35 cents per b.hp.-hr., or about one-fifth as much, a fuel cost saving of not less than 80 per cent.

There is, of course, a dual advantage gained with the Diesel due to the fact that not only is the fuel of a much cheaper grade but also the weight of fuel to be carried for any given cruising range is considerably less with the Diesel engine than with the gasoline engine, thus making it possible to either extend the cruising range or carry more pay load in accordance with the requirements of the case.

Another point in connection with the Diesel aircraft engine which is worthy of mention is that lubricating

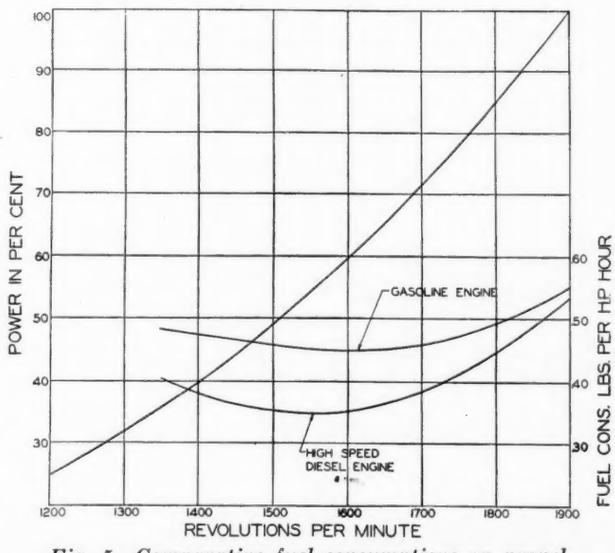


Fig. 5—Comparative fuel consumptions on propeller load

oil is consumed cleanly to produce power, and thus contributes its small share to the efficient production of power in this type of engine. In other words, any excess of lubricating oil in a gasoline engine combustion chamber is naturally considered extremely undesirable, as the temperatures on the walls are not sufficiently high to burn the oil completely, resulting in the formation of carbon and trouble with spark plugs from this source, whereas in the Diesel engine the temperatures are considerably higher and, there being invariably an excess of oxygen available, perfectly clean combustion of lubricating oil follows. While excessive oil consumption in a Diesel is naturally to be avoided owing to the high cost of lubricating oil as a fuel, nevertheless it is interesting to realize that so far as the total weight of the oil consumed is concerned it matters very little whether this consists of lubricating or fuel oil, so far as miles per pound of oil carried is concerned.

From a cooling standpoint the air-cooled Diesel engine presents far fewer problems than the air-cooled gasoline engine. In the first place, high cylinder head temperatures, which must be avoided in the gasoline engine in order to prevent preignition and detonation, offer no serious handicap to the Diesel engine designer.

Less Noise from Exhaust

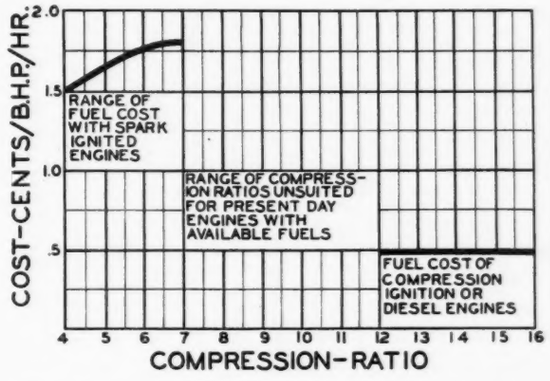
Similarly, exhaust valve conditions appear to be far more favorable in the Diesel engine than in the gasoline engine, for the reason that exhaust gas temperatures are considerably lower, due to the high expansion ratio employed and for the same reason there is a considerable diminution of noise due to the exhaust.

By the same token there is very little visible flame ejected from the exhaust ports, and it has been found quite feasible to fly the Stinson-Detroiter equipped with the Diesel engine without exhaust stacks or manifolds, thus eliminating a knotty design problem which is a continuous source of worry to airplane designers.

An interesting point of advantage in connection with a Diesel aircraft engine is the fact that it will operate successfully in any position. All carbureting engines are dependent upon gravity so far as the correct functioning of the carburetor is concerned, and consequently the gasoline engine will not continue to run beyond certain angles of inclination dependent upon the carburetor design.

The acceleration of the Diesel aircraft engine is at all times excellent, regardless of the temperature conditions or how long the engine has been idling. This is in marked contrast to gasoline engines, which must be carefully nursed on a long glide, especially in cold weather, to insure the engine accelerating promptly in the event of full engine power being required previous to making a landing.

Another interesting point in connection with the operation of a Diesel aircraft engine is that it is not affected by rain or water in quantities which would seriously interfere with a gasoline engine. Primarily, of course, this is because there are no high tension electric currents to be short-circuited by water, but the question of a single carburetor air inlet also enters.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RANGE OF FUEL COST WITH SPARK IGNITED ENGINES
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FUEL COST OF COMPRESSION IGNITION OR DIESEL ENGINES
4 5 6 7 8 9 10 11 12 13 14 15 16
COMPRESSION-RATIO

Fig. 6—Costs of the horsepower hour with various fuels in different types of internal combustion engines
(For further details see Table I)

For example, in taking off with a seaplane it frequently happens that just at the critical instant when the plane is about to get up on its step and every bit of available power is required, considerable water will be either shipped into the carburetor, which on the average air-cooled engine necessarily will be in a low and therefore disadvantageous position, or the propeller will pick up water with the same result, and the engine will naturally choke and lose revolutions, necessitating a fresh start.

A Diesel aircraft engine has been run for many hours without the slightest disturbance in excessively heavy downpours, which would undoubtedly cause serious missing, if not stoppage, of a gasoline engine.

On the basis of power output per unit of piston displacement the Diesel aircraft engine falls considerably short of the best gasoline engine practice. Expressed in other terms, brake mean effective pressures as high as 130 to 140 lb. per sq. in. are readily obtainable in well-designed gasoline engines, whereas 100 to 110 lb. brake mean effective pressure can be considered a good achievement with a high-speed solid fuel injection oil engine. However, in this connection it should be borne in mind that these latter figures apply to the rated power output of the Diesel engine which it is capable of sustaining for long periods and which takes into consideration the need for perhaps 25 per cent excess air over and above that required to furnish sufficient oxygen to combine with the fuel and thus insure complete combustion.

Table I

Cost of One B.Hp./Hr. With Various Fuels in Different Types of Internal Combustion Engines

Type of Engine	Fuel	Comp. Ratio	Lb. Per Gal.	Spec. Gr. Be.	Cents Per Gal.	Cents Per Lb.	Lb. Per B.Hp./Hr.	Cost—Cents Per B.Hp./Hr.
Otto Cycle Spark Ign.	Kerosene	4:1	44	12.7	6.72	1.89	.80	1.51
Otto Cycle Spark Ign.	Motor Gasoline	4.5:1	59	14.8	6.17	2.40	.65	1.56
Otto Cycle-Spark Ign.	Ethyl Mtr. Gas.	5.5:1	59	17.8	6.17	2.88	.60	1.73
Otto Cycle Spark Ign.	Aviation Gasoline	5.5:1	63	19.8	6.04	3.28	.52	1.70
Otto Cycle Spark Ign.	Ethyl Av. Gas.	7.1	63	22.8	6.04	3.78	.48	1.82
Comp. Ign. Diesel Cy.	Furnace Oil	12-16:1	38	10.2	6.94	1.47	.38	.56
Comp. Ign. Diesel Cy.	Diesel Oil	12-16:1	24	7.0	7.57	.93	.38	.35

However, it is quite feasible to overload the Diesel engine so that nearly all of the excess air combines with the additional fuel. When this is done combustion is no longer as complete or efficient as is desired for normal running, but a considerable increase in power can be obtained at the expense of fuel economy and this procedure in the case of an aircraft engine is not only permissible but desirable during the comparatively short periods that maximum power is required, such as during take-off and, occasionally, climb.

This extra margin of power, which can be obtained from a Diesel engine, represents a very important item which must not be overlooked in making weight comparisons between the gasoline engine and the Diesel engine.

This paper would not be complete without reference being made to another benefit derived from the use of the Diesel aircraft engine and that relates to the question of radio interference. With the gasoline engine using high tension current for ignition, interference from this source has been very great, especially with reference to the reception of radiophone messages. It has been found that the interruption of the primary current and the creation of each high tension spark result in wave emissions from both primary and secondary conductors, as well as spark plug terminals and all other exposed conductors, which inpulses are impressed on the receiving apparatus in the plane so powerfully as to compel the adoption of radio shielding means. These means in themselves have a boomerang influence on the ignition system of the engine, and while I am perfectly willing to admit that a satisfactory compromise may be found, there is no question that the liability of the ignition system to break down is greatly increased by the radio shielding means which necessarily include the provision of metal in close proximity to all live parts of the circuit.

Important in Fog Flying

This question of elimination of radio interferences promises to be of extreme importance in the future, since it is the consensus of opinion that only through the use of radio will blind flying through fog and thick weather be ultimately possible. If this proves to be the case it is natural to presume that clear reception free from the interference of electrical engine ignition systems will be of paramount importance, and the use of Diesel engines, it can be seen, will greatly facilitate this condition.

It might be of interest to attempt a little prophesying as to the effect of Diesel aircraft engines on airplane design. Engine controls are very much simplified in the case of the Diesel engine. In a Diesel engine, electric spark control is eliminated, and the fuel injection quantity can be controlled in any one of a number of different ways. The function of the altitude control used with gasoline engines is admirably met by the Diesel control. For example, should it be desired to climb an airplane from the ground with wide-open throttle, with the Diesel engine it is merely necessary as altitude is gained to reduce the fuel supply without appreciably affecting the revolutions of the engine, just as is done with the altitude control of the ordinary aircraft engine carburetor. However, there is this important distinction: Should the Diesel fuel supply be made too lean the engine will merely slow down, whereas if the altitude control of the gasoline engine is set too lean the engine will naturally either misfire or quit, the result being that in practice practically all experienced pilots are wary of utilizing the altitude control to the fullest extent.

Incidentally, it might be stated at this point that in a multi-cylinder aircraft engine the use of the altitude control is always limited by the cylinder receiving the leanest mixture, it being well known that perfect distribution of exactly the same quality of mixture to all cylinders is practically impossible to obtain. In the case of the Diesel engine close regulation of the same quantity of feul injected to each cylinder can be readily secured and even if these respective quantities of fuel should vary appreciably, the engine still continues to function perfectly without any of the "spitting back" behavior encountered with the gasoline engine suffering from uneven distribution.

Single Engine Will Suffice

The major influence, however, which Diesel engines may be expected to exert on airplane design is in regard to the number of powerplants employed. It is well known that aerodynamically the most efficient airplane is one with a single engine. Twin-engined and three-engined airplanes have been developed largely with a view to insuring continued operation should one engine fail. In some instances multi-engined planes have been necessitated by the lack of powerplants of sufficient size to give the power required in a single unit. However, this phase of the situation can be considered merely as a transitory one, since nothing has transpired in aircraft engine design which sets any reasonable limit on the power output for a single engine.

Neglecting then the temporary condition which arises from time to time and results in multi-engined installations being selected on the basis of available power units, we are faced with considerations of safety as affected by utilization of multi-engine principles. The gasoline engine which has hitherto been used exclusively as an aircraft powerplant is notoriously one of the most delicate prime movers available. By this is meant that no matter how robust the design of the engine may be, its continued operation depends vitally on the correct functioning of a great many small parts which from their very nature cannot be made as sturdy as could be desired. Both ignition and carburetion systems are replete with instances of this kind.

A few months' experience with an engine operating on compression ignition will convince even the most biased of engineers that a most important move in the direction of safe aircraft engine operation results from dispensing with the electrical ignition systems of the gasoline engine.

Reverting again to questions of operating reliability of the aircraft engine carburetor and the Diesel fuel injection system respectively, it has been previously argued that the Diesel aircraft engine has greater inherent reliability in respect to fuel injection means than has a gasoline aircraft engine in relation to its carburetion system. Some additional detailed discussion on this point is perhaps of interest.

Carburetor Trouble Eliminated

It has already been stated that the principal reason for this inherent reliability of the Diesel engine lies in the fact that each of the cylinders is independent of the others, whereas in the carbureting engine one carburetor is used to feed three or nine cylinders in conventional designs so that the failure of the carburetor to function results in either three cylinders missing, or the stoppage of the engine in the event of there being only one carburetor.

Interruptions to the fuel supply are frequently caused by dirt in the fuel and, of course, this could happen just

as readily with the Diesel as with the gasoline engine. However, with the oil injection system only one cylinder will be affected, whereas if dirt lodged in the main jet of a single carburetor of a nine-cylinder gasoline engine the engine would naturally stop due to cutting off of all fuel supply.

Then again, aircraft engine carburetors are subject to troubles of their own, due to ice or snow formation on the throttles when operating in cold, damp weather. Many forced landings have resulted from this trouble which can be avoided by the proper application of heat which requires an additional manual control to prevent loss in power at higher operating temperatures. The Diesel engine is immune from such troubles and so far as experience to date has shown, operations in temperatures ranging from 18 deg. Fahr. to 95 deg. Fahr. have been uniformly satisfactory.

Granting then that both from an ignition and fuel-feeding standpoint the outstanding advantages of the Diesel lie in its inherent reliability, we are prepared to consider the point that a single Diesel engine plane has all the reliability characteristics of a three-gasoline-engine plane.

The three gasoline engines would each be equipped with two ignition systems, making a total of six independent ignition systems, whereas the single Diesel engine with its nine cylinders would have nine independent ignition systems with the added advantage that the Diesel ignition system requires no additional parts on the engine and each gasoline engine ignition system consists of several hundred separate parts. The three gasoline engines will have three independent carbureting systems; the single Diesel engine will have nine independent fuel injection systems, so that here again on the score of reliability gained by duplicating important elements the Diesel engine possesses a wide margin over its competitor.

Built to Withstand Pressures

We now come to consider other parts of the engine from the standpoint of reliability, and to do justice to this phase we must consider one new distinction between the operation of the Diesel and the gasoline engine. Maximum cylinder pressures in the Diesel are absolutely fixed by the design and these are not varied appreciably by a wide range of different fuels. Maximum cylinder pressures in a gasoline engine may vary over a range as high as 3 to 1 considering the case of an engine detonating either due to a poor grade of gasoline, hot exhaust valves, hot spark plugs or overheated cylinders.

In other words, detonating pressures in a gasoline engine approximate the maximum cylinder pressures of the Diesel aircraft engines, but it should be noted that the Diesel engine is designed and ground-tested to withstand these pressures over long periods of time, whereas the gasoline engine is invariably ground-tested under ideal conditions with detonation suppressed. On the other hand, it frequently happens that an aircraft gasoline engine of relatively high compression will be operated on commercial motor gasoline due to inability to secure a supply of aviation gasoline, and it thus becomes necessary for the pilot to fly considerable distances with the engine detonating, or in normal operation detonation may set in due to failure of one ignition system, or other causes. These detonating pressures in a gasoline engine, for which the engine is not designed, will invariably result in serious damage to the engine if allowed to persist for any length of time. Piston seizure is quite common from this cause, and crankshaft failure by no means unknown.

The point to be emphasized is that the gasoline engine is occasionally abused either through carelessness or as a result of an emergency, so that it is very liable to failure from this cause. The Diesel engine cannot be abused, as there is no way in which the operator can increase the maximum cylinder pressures over those which the engine was designed to meet.

Consequently, apart from considerations of ignition and carburetion reliability, it may be necessary to employ three gasoline engines to provide the utmost dependability on account of the fact that the engines can be abused and to that extent are not fool-proof.

Extra Propellers a Hazard

There are perhaps some who would claim extra dependability of the three gasoline engines on the score of having three separate propellers, but from this standpoint this may be considered an extra hazard. Propeller failure, while extremely rare, is also very serious, and if one blade alone should suffer damage, the resulting unbalanced centrifugal force on the other blade is usually sufficient to tear the engine loose from its mount, if not to throw the entire powerplant completely out of the plane, as has happened in a few instances. It is certainly preferable to have a propeller go to pieces on a conventional single-engined plane rather than on a wing engine of a twin or triple-engined plane with the possibility of doing serious damage to the fuselage or controls.

Taking all things into consideration, and without reference to the important aerodynamic advantages of the single-engined plane, it would appear that the advent of the Diesel aircraft engine brings about the necessity for thoroughly reviewing the subject of single versus multi-engined planes.

In the final analysis any transportation system must justify its existence on economic grounds, and the cost of operation of a single-Diesel-engined plane as compared with a three-gasoline-engined plane must be in the order of at least one to four which constitutes an inducement which no transportation executive can afford to ignore.

Summing up, the advantages of Diesel engines for aircraft may be covered in the following statements:

1. The Diesel engine is inherently far more reliable than the gasoline engine because:
   (a) The electrical ignition system is entirely eliminated.
   (b) A separate fuel injection means is applied to each cylinder insuring maximum dependability.
2. The fire hazard is reduced to the absolute minimum.
3. The specific fuel consumption is reduced about 20 per cent.
4. The specific fuel cost is reduced about 70 per cent.
5. Open exhaust ports, eliminating the weight and drag of exhaust manifolds, are permissible, both from noise and night flying vision standpoints.
6. Engine operation is not affected by temperature or humidity conditions; flexibility of control is assured at all times.
7. Radio interference is eliminated.
8. Basic reliability of the Diesel engine justifies a reduction in the number of powerplants in large planes and presages a consequent important reduction in the cost of maintenance and operation of commercial air transportation facilities.

NEGOTIATIONS are said to be in progress looking to an amalgamation of the German Mercedes-Benz and the Belgian Minerva firms.

Hupp-Chandler Deal Consoli

By Norman G. Shidle

THE acquisition of the Chandler-Cleveland Motors Corp. by Hupmobile has been practically completed, important members of the Hupmobile board of directors have been elected to the new Chandler-Cleveland board, and the basis of exchange of Chandler-Cleveland for Hupp stock has been announced. Thus the third of the important car company consolidations of 1928 is in the final stages of completion. While lacking some of the spectacular features of the Chrysler purchase of the Dodge interests, this latest merger, like the Studebaker acquisition of Pierce-Arrow which preceded it by several months, marks another definite and important step in the consolidation of the car producing forces of the industry and in the basic strengthening and stabilizing of the vehicle manufacturing field as a whole.

Commenting on the purchase a week ago, DuBois Young, president of both the Hupp and Chandler-Cleveland organizations, said:

"The acquisition by Hupp Motor Car Corp. of Chandler-Cleveland Motors brings together two concerns whose products occupy an established position in the passenger car field and are supplementary rather than competitive. The Hupp company gains additional plant capacity badly needed to maintain production in satisfactory relation to demand and rounds out its line with two cars in a price class somewhat below the field in which it has up to now specialized. Chandler-Cleveland Motors, on the other hand, obtains the advantages of the management and direction which have been responsible for the rapid progress made by the Hupp company in recent years.

Both Will be Strengthened

"The position of both companies will be strengthened by the substantial savings made possible by the elimination of duplicated executive overhead and by the greater concentration of buying power. Another important consideration bearing upon the combination is that in the keen competition which exists in the motor industry today the major profits are open to those organizations whose size and range of product enables them to realize the fullest extent of large-scale productive and distributive effort. The existing line of Chandler cars will be continued and the efforts of our organization will be devoted to their further improvement."

Final consummation of the stock exchange plan which has been worked out will follow deposit of at least 95 per cent of the preference stock and at least 95 per cent of the common stock of the Chandler-Cleveland Motors Corp., the depositories for the managers being The Guaranty Trust Co. of New York, the Union Trust Co., of Cleveland, and the First Trust & Savings Bank of Chicago. Deposits of the Chandler-Cleveland stock will be received until Jan. 10, 1929. Landenburg, Thalmann & Co. and A. G. Becker & Co. have been designated as managers to put the combination into effect. The stock exchange plan announced by the managers is as follows:

Holders of Chandler-Cleveland stock are to receive one share of Hupp common stock for each two shares of Chandler-Cleveland preference stock and one share of Hupp common for each three and one-half shares of Chandler-Cleveland common stock.

The new Hupmobile-Chandler-Cleveland combination will start into 1929 with total assets in excess of $40,000,000 and securities worth on the stock market well over $100,000,000. The merger of the two organizations brings this new unit into ninth place among automobile units so far as total assets are concerned. It is topped in this respect by G.M.C., Ford, Chrysler-Dodge, Studebaker-Pierce-Arrow, the Willys interests, Hudson, Packard and Nash in the order named.

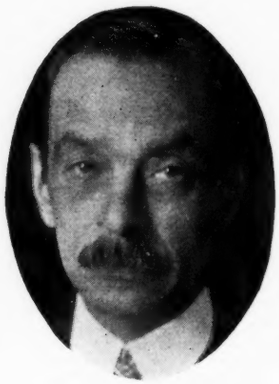
The acquisition of the Cleveland organization by Hupmobile probably reflects, not only the need on the part of DuBois Young's organization for larger manu-

Newly Elected Chandler-

Charles D. Hastings

Arthur von Schlegell

Charles Bradley

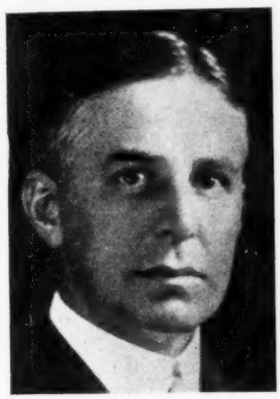


Robert C. Schaffner

These eight men, together with Hiram J. Halle of Chicago, Motors Corp. Seven of them are directors of Hupmobile. served before on either board, were chosen to represent

dates *$40,000,000 in Assets*

Cleveland Directors



J. Walter Drake

DuBois Young

Moritz Rosenthal

John Sherwin, Jr.

make up the new board of directors of Chandler-Cleveland The two others, Bradley and Sherwin, neither of whom Cleveland interests which retain a holding in the corporation

facturing facilities following the spurt in Hupmobile's business beginning a year ago, but also another move to further strengthen distributing possibilities through the merger of dealer organizations which has been a characteristic of most of the recent passenger car company combinations. The bringing together of the Chandler-Cleveland and Hupp dealers under one management will result in a retail organization totaling about 2000, approximately 35 per cent of which will be contributed by Chandler-Cleveland.

The two organizations together sold in this country in 1927 about 53,000 cars, which amounted to about 1.99 per cent of the total domestic passenger car sales of the industry in that year. In only nine months of 1928, however, due to the exceptional gains recorded by Hupp, the combination marketed nearly 60,000 cars in the United States or about 2.4 per cent of the total for the industry.

While there is direct conflict between certain models now built by the two companies, the new combination will have a wide range of coverage with models selling as low as $875 and as high as $2,295. The chief overlapping between the lines as at present constituted lies in the range between $1,395 and $2,000. The Hupp A 4-door sedan, for instance, and the Chandler Royal 75 4-door sedan both sell at present for $1,395, f.o.b.; the Chandler Big 6 cabriolet is priced at $1,825, while the Hupp M 2-door sedan lists at the same figure. The Hupp M 4-door sedan lists at $1,875, $50 under the Chandler Big 6 4-door sedan at $1,925.

Generally speaking, the combination would seem to bring to the Hupp organization a goodly number of established dealers, increased manufacturing facilities to take care of current and future needs and a line of cars already competing in the $800-$1,000 field, a market heretofore not penetrated by Hupmobile products.

Hupp in Full Control

The statement, quoted at the beginning of this article, indicates what has been fairly confidently believed by a good many executives in the industry, namely, that the Chandler-Cleveland deal was primarily a Hupp Motor Car Corp. proposition from beginning to end. With seven Hupp directors on the New Chandler board, the ideas of the present Hupp management will dominate the thought and action of the new combination.

For the last few years at least Hupp management has been expressed largely through the unusually practical yet unusually human personality of DuBois Young. The story of how he caught the automobile bug through a visit to the 1902 Chicago show on a free pass, how he came up through the mechanical and manufacturing ranks to the general managership and finally the presidency of Hupp, has been told too often and too vividly to need repeating here.

The financial as well as the psychological background of this new merger seems sound inasmuch as Hupp already had been setting financial records long before the outstanding success of its present line. As far back as the end of 1925, it was figured out that an original dollar invested on Hupmobile at its beginning would have been worth at that time about $2,000; and in 1925 Hupp had a net income of $3,797,335. This year its net income for the first nine months totaled $6,694,000.

Chandler's record from a profit standpoint, of course, has not been as favorable, although its total output of cars this year should exceed 25,000. Hupp total output this year doubtless will show over the 75,000 mark. For the first six months of this year Chandler-Cleveland Motors Corp. showed a net income of $61,060.

Chandler-Cleveland Motors Corp. itself, of course, is a result of a consolidation in 1926 of the Chandler Motor Car Co. and the Cleveland Automobile Co. The original Chandler company was founded in 1913 and was one of the pioneers in building a medium-priced six-cylinder car. The Cleveland Automobile Co. was started in the early part of 1919 by F. C. Chandler, and his associates.

Automotive Industries
December 22, 1928

Trend Toward Metric Spark Plug Compression of Engines

Smaller thread diameter makes for easier cooling and minimizes trouble caused by preignition.

By Hector Rabezzana
Chief Spark Plug Engineer, AC Spark Plug Co.

OF the various characteristics of the ignition spark, its appearance, that is, its fatness, color, etc., does not determine its ignition value. It is not possible to add to the power of an engine by adding condensers, retardation coils, auxiliary gaps and the like to the ignition system. This statement must be taken as referring to the spark, and not to the spark plug, for it is well known that the use of an improper type of spark plug may cause preignition, and old and fouled spark plugs may cause missing and resultant loss of power.

The spark plug, being exposed to the burning gases at its lower end, absorbs an amount of heat proportional to the surface exposed to the heat. Part of the heat thus absorbed must pass off through the seat of the plug, but enough should be retained to always keep the plug at a sufficiently high temperature to prevent fouling, as will be explained later.

Temperature Causes Fouling

Fouling depends mainly on the temperature of the plug, as can be demonstrated by means of the apparatus shown in Fig. 1. Rods of different materials, with holes for thermo-couples in them at definite intervals, are heated in this apparatus, and oil is dropped on the side which is exposed to room temperature. The rod is inclined at such an angle that the oil will flow along it. If the furnace is maintained at 900 deg. C., the oil will begin to carbonize at a certain point along the rod, and will burn off at a point nearer the furnace, where the temperature is still higher. The points where carbonization and burning begin vary with different oils, but the differences are slight. If the rod is of a material of high heat-conductivity, the temperature gradient will be less and the carbon deposit will extend over a considerable portion of the length of the rod, within which there may be several thermo-couples.

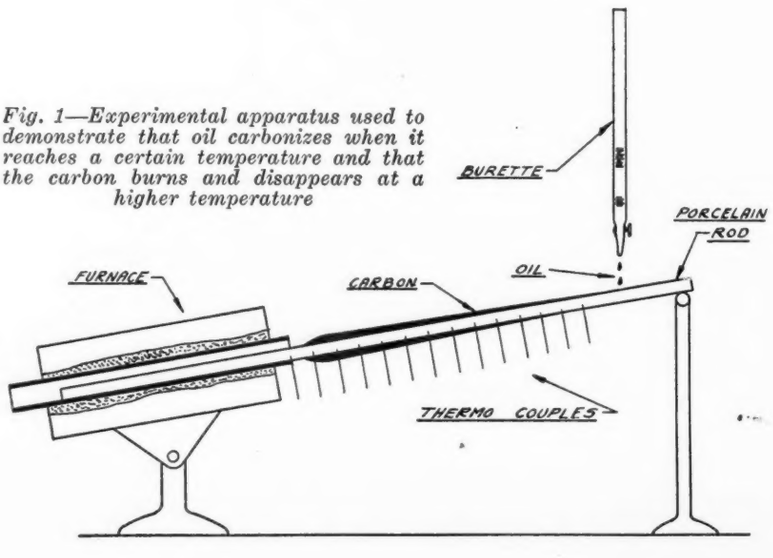


Fig. 1—Experimental apparatus used to demonstrate that oil carbonizes when it reaches a certain temperature and that the carbon burns and disappears at a higher temperature

The above test shows the desirability of keeping the insulators of spark plugs at a temperature high enough to burn away the carbon, because carbon is a good conductor of electricity and when covering the end of the insulator will short-circuit the plug and cause missing. This is the reason why there is a limit to the so-called "coolness" of a plug. If a plug is so designed that it cannot hold enough heat to reach a temperature that will enable it to burn the carbon, it will give trouble from fouling. It is for this reason that a racing plug, which is designed to take care of abnormal heat, will make a very poor showing in a regular engine, where it will cause fouling trouble.

If thermo-couples are set into a plug designed to receive them (Fig. 2) in such a way that the temperature of the hottest part of the plug when the engine begins to preignite can be read off, and the test is carried out with the various fuels on the market, the experiment will enable one to determine the temperatures which mark the limit of usefulness of the plug with the different fuels.

Preferably the plug should always be hot enough to burn any carbon that may be formed, but not hot enough to cause preignition. Unfortunately, the temperature range marked by these two limits is comparatively narrow — only about 350 deg. C.—which explains why plugs may easily cause trouble.

By referring to Fig. 3 it can be seen that the heat absorbed by the plug at its inner end, passes from the end of the center wire through the tip of the insulator, the body of same, the seat gasket, the spark plug shell, and the plug gasket into

Due to Higher

the cylinder wall and the cooling water. The threaded portion of the plug conducts only a negligible portion of the heat absorbed, and practically all of the heat must pass through the seat. There are numerous factors which tend to cause the temperature of the plug to vary, these including:

Engine revolutions per minute.
Load on engine.
Cooling water temperature.
Engine temperature.
Kind of fuel.
Spark advance.
Air/fuel ratio.
Air humidity.
Temperature of air around plug.
Draft around exposed part of plug.

Considering the enormous difference in temperature between the coldest day of a northern winter and the hottest day of a southern desert, it will be appreciated that if the same plug is used under both conditions in the same car, it will give trouble in one case or the other.

Control of Temperature

Fig. 4 shows plugs of different designs, with paths of heat flow of different lengths, and illustrates how, by varying the resistance to heat flow, especially in the insulator, the working temperature of the plug can be controlled.

If the diameter of the threaded part of the plug is increased or decreased while the general proportions of the design remain the same, the amount of heat absorbed by the plug is increased or decreased in direct proportions to the area exposed to the heat. For instance, the heat-exposed surface of a 7/8-in. plug is one-and-one-half times as great as that of an 18 mm. plug, and since the area of the seat—through which the heat must flow—is nearly the same in both cases (the difference being 10 per cent at most), the 7/8-in. plug will get much hotter.

It has been stated already that very little heat flows through the threaded part of the plug, and this explains why using a metric plug in a 7/8-in. spark plug hole with an adapter does not give the same results as using a metric plug in a hole tapped directly in the cylinder wall. The extra resistance to the flow of heat through the threads of the adapter bushing offsets the gain due to the reduced heat-exposed area. But cylinders designed for the use of 7/8-in. plugs can be tapped for metric plugs. instead, and the full benefit of the reduced heat-exposed area obtained, as the increase in the resistance to heat flow due to the greater thickness of the metal in the boss is negligible.

The advantage of the metric plug over the 7/8-in. resulting from the smaller thread diameter of the former, can be easily brought home by considering extreme cases. If an engine were equipped with plugs of a diameter equal to the cylinder bore, the most exposed part of the plug, the lower part of the insulator, would be so far from the cooling water that it would reach the preignition temperature in a few seconds. On the contrary, if the engine were provided with plugs of, say, 1/16-in. diameter, the hottest point of the plug would not be much above the temperature of the cooling water. In other words, the plug temperature would be of the same order as the cylinder wall temperature, which would be ideal from the standpoint of plug operation.

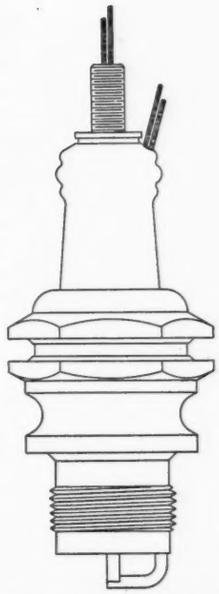


Fig. 2—Spark plug with thermo-couple inserted in it

Lately, owing to the introduction of anti-knock fuels and developments in combustion chamber design, the automobile industry has increased compression ratios and engine speeds. A high-compression engine requires a plug that—under similar working conditions—remains cooler than the type of plug needed for a low compression engine. This accounts for the present trend away from the 7/8-in. and toward the metric plug. The temperature of the combustible gases toward the end of the compression stroke increases with an increase in compression. This rise in temperature is quite large, and it affects the spark plug temperature.

The compression in the engine varies with the opening of the throttle and the speed of rotation of the engine. If the car is operated in the city, there will be hardly any chance to open the throttle wide and get the full benefit of the high compression. Such an engine, therefore, really operates as a low compression engine, and it requires a plug specially designed to prevent fouling, which is the greatest trouble under these conditions of operation. If, on the other hand, the car is driven in the open country, at a sustained high speed, the throttle will be fully open most of the time and the engine will fully utilize its high compression. The temperature of explosion will be far higher than in the previous case, and the number of explosions

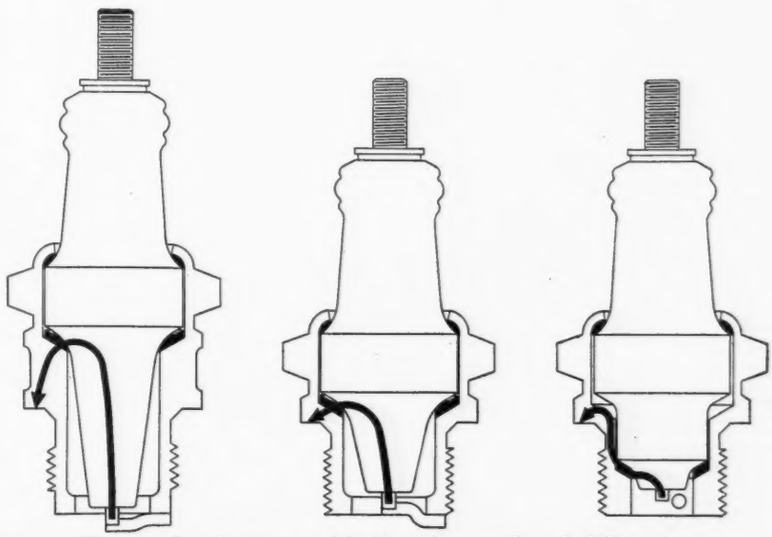


Fig. 3—Spark plugs with heat-flow paths of different resistances

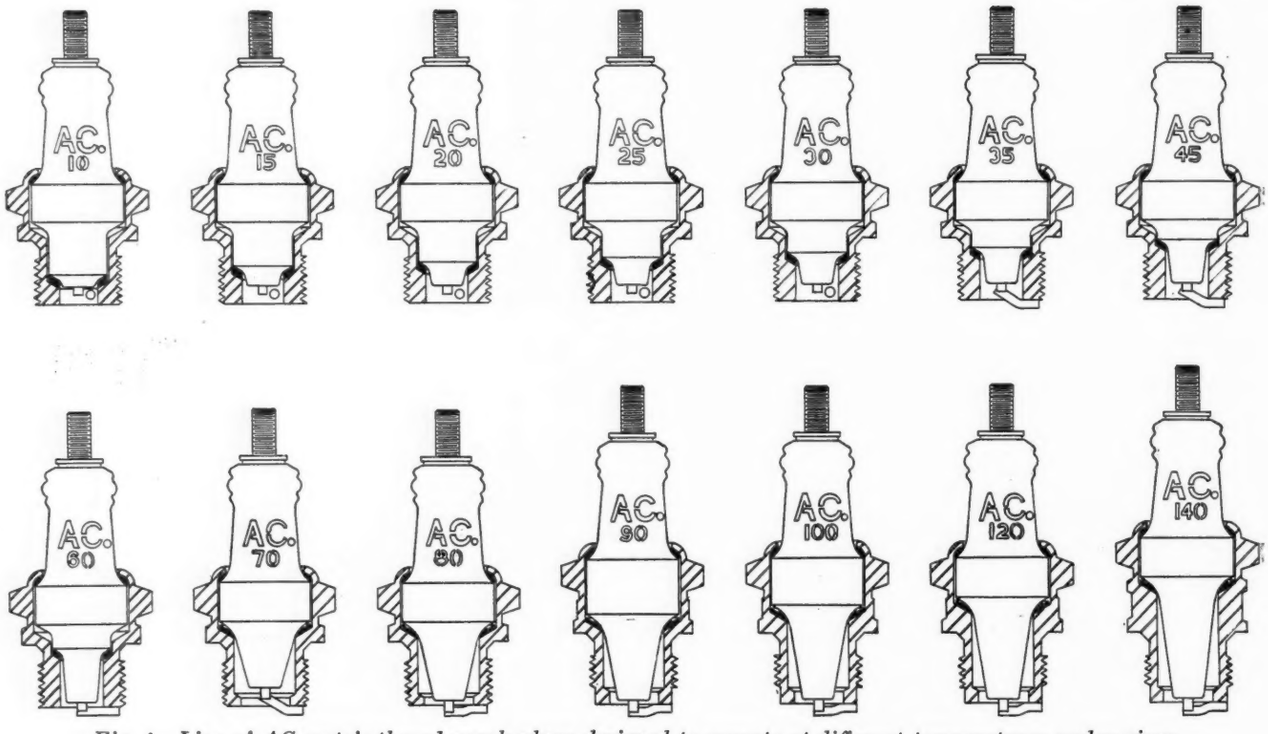


Fig. 4—Line of AC metric-thread spark plugs designed to operate at different temperatures under given engine conditions

in a given time will be twice or three times as great. This means that the plugs are exposed to a higher temperature of combustion and must dissipate much more heat in a given time, owing to the greater frequency of explosions. It can therefore be safely said that if this car is equipped with the same kind of plug as those usually used for city driving, which are incapable of operating satisfactorily under a wide temperature range, they will not stay cool enough to prevent preignition.

The present trend in engine design calls for metric plugs. Plugs with 18 mm. thread are being standardized in American practice for the reasons outlined in the foregoing, and not because of any desire to adopt the metric system. The U. S. Army and Navy specifications for aircraft engines call for 18 mm. (or metric) spark plugs.

For many years the S.A.E. and the Division of Simplified Practice of the United States Department of Commerce tried to standardize spark plug sizes. These efforts did not culminate in any satisfactory results, as it was found impossible to agree on size, length of thread, length of plug body, size of hexagon, etc. The only thing that could be done was to standardize limits on the thread. However, when we consider that the AC Spark Plug Co. is manufacturing 70 different types of plug, varying with respect to pitch and diameter of thread, length of body, thread length, etc., we see that standardization is badly needed. Development in engine design calls for plugs that keep cooler than those already on the market, which means that new plugs must be designed and produced with every forward step in engine development. This entails loss of time and imposes hardships on spark plug manufacturers, and it would be really impracticable to make ranges of plugs for each of the 30 or more types of plug most used.

To meet this situation, the AC Spark Plug Co., after extensive experimental work, has developed a line of 14 metric plugs as illustrated in Fig. 4. This line of plugs is so designed that each member of it will—under given working conditions—keep slightly cooler than the one which follows it. Each plug is identified by a number, and the higher this number the better the plug is adapted for use in a "cool" engine. This line of 14 plugs takes care of the requirements of all present-day engines, from the engine of a low-priced four-cylinder car to a racing car engine, and an engine of the outboard marine air-cooled racing type. Plug No. 15, for instance, is used by racing drivers on fast tracks, while No. 25 is much used on fast motor boats with outboard motor.

THE number of automobiles in Switzerland is increasing rapidly and in all probability will have reached 100,000 by Jan. 1 next. At the end of 1927 the country had one automobile to every 45 inhabitants. At the present time the canton having the greatest automobile density is Geneva, where there is one car to every 20 of population. This is followed by Grison, with one car to 33, Zurich, with one car to 35, and Neuchatel, with one car to 39. The above figures are based on the total numbers of automobiles, motor trucks, buses and motorcycles owned. The proportion of automobiles among the total is greatest in Geneva, while in Zurich the proportion of trucks (3000 out of 15,000) is greatest.

TRAFFIC congestion in the central part of Paris is said to be getting intolerable, and among the schemes recently put forward to relieve the situation is that of three large vehicular tunnels or underground roadways, to connect the northern part of the city with that portion lying on the opposite bank of the Seine. These roadways are to follow existing main thoroughfares and will contain a double roadway and two foot paths with outlets for passengers. A vast underground garage under the Gardens of Tuileries is included in the scheme.

British *Motorcycle* Builders Turn to Four-Cylinder *Engines*

Pressed steel frames and all-inclosed powerplants are other features found on new models at annual show.

By M. W. Bourdon

THIS year's motorcycle show at Olympia, London, brought to light more notable departures from orthodox practice than any show held since the war.

Four-cylinder engines appeared for the first time in British machines of well-established make; the pressed steel frame, represented last year in one model, has found additional adherents, and several makers introduced new models with the engine, transmission, etc., completely inclosed. Dry sump lubrication is used on quite a number of machines; roller bearing wheels are numerous, while engines with twin-ports for the exhaust are found on over a dozen different makes.

A four-cylinder model has been added to the Brough Superior line (often termed the Rolls-Royce of motorcycles). Like the two-cylinder models of this make it is a decidedly expensive machine, being priced at $1,000 as a solo mount. It is a "Straight Four," and has a displacement of 55 cu. in.

Another four is the A.J.W. In this case a water-cooled L-head engine of 60 cu. in. capacity is used and is mounted on a frame consisting of two pressed steel side rails reminiscent of car practice.

A third new four is the McEvoy, which has an air-cooled overhead camshaft engine of 36 cu. in. in a duplex cradle frame of tubular construction.

A duplex cradle frame, unit construction, all-inclosed powerplant and transmission, duplex steering and rear spring frame characterize a new O.E.C.-Tinkler, which has a single cylinder water-cooled overhead camshaft engine.

Unorthodox in a score of directions is the Ascot-Pullin. It has a pressed steel frame consisting of a duplex unit forming also a cover and the side shields of the powerplant; the latter is a horizontal air-cooled single-cylinder engine with overhead valves. The drive to the unit three-speed gearset is by double helical gears and the final drive by chain, with two transmission shock absorbers. Steel pressings are used also for the front forks and handlebars, the latter being cylindrical at the ends but flattened between the hand grips to form an instrument board. A novelty is the provision of hydraulically operated brakes.

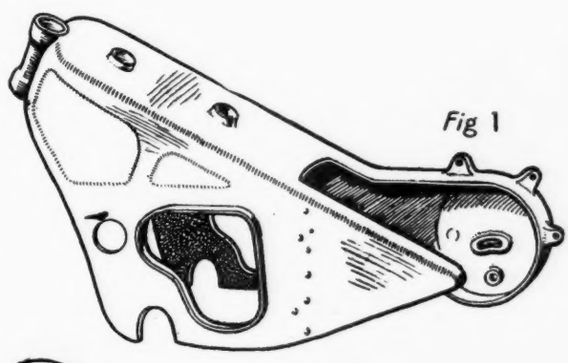
Another make with pressed-steel frame is the Coventry Eagle, which is shown in five models, one pressed steel frame model having been marketed last year. The Eagle frame is reminiscent of tubular frames in its outlines.

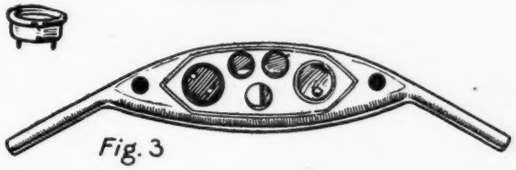
Pressed steel fuel tanks are widely in evidence for the first time at the show, and, as with tanks generally, they are nearly all of the "saddle" type, consisting of two compartments, one at each side screening of the top tube of the frame. In connection with tanks it is of note that the oil tank has suddenly become a separate entity in a great many cases, located under the saddle. The reasons are a desire to provide a larger fuel tank and to avoid leakage of oil into the fuel. In numerous new models the separate tank is accompanied by dry sump engine lubrication, which is another departure from previous practice.

Mechanical pump lubrication in one form or another has almost entirely superseded the hand-pump pressure systems that were common until a few years back.

There are two reasons why so many makers are now offering engines with two exhaust ports per cylinder. One is to secure freer exit for the exhaust gases and the other to enable better silencing to be secured without an over-large muffler.

Prices in general show but little variation. Two or three makes are down from 10 to 15 per cent, but 5 per cent is the average cut for the industry as a whole.





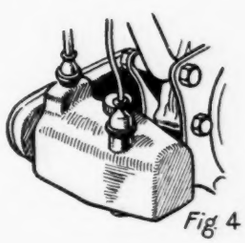


Fig. 1—Pressed steel frame of Ascot-Pullin motorcycle. Fig. 2—Cast aluminum primary expansion chamber of new Imperial, connecting to two mufflers. Fig. 3—Pressed steel handlebar and instrument panel on Ascot-Pullin. Fig. 4—Magneto on Norton machine protected by aluminum cover

Continuous Furnace Improves Gear Hardening Process

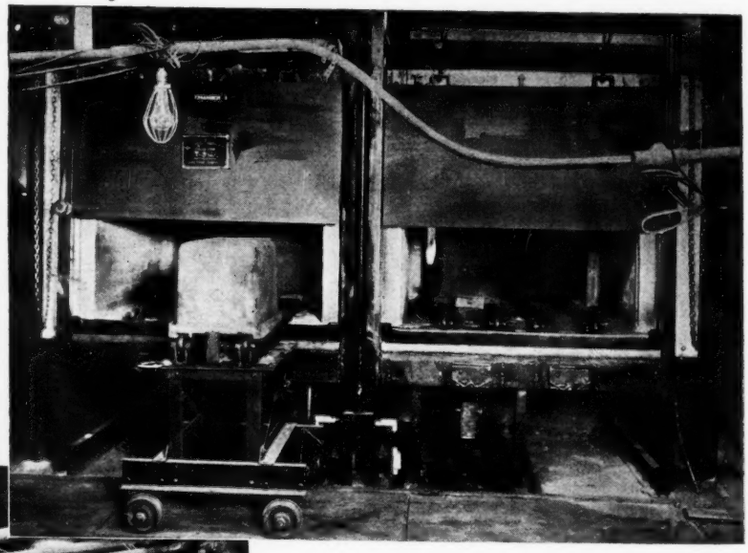
Ideal way of annealing forgings en masse is to have them pass through series of heating and cooling zones maintained uniform by automatic pushing and fuel control.

MANY possibilities for substituting mechanical heat-treating operations for manual work, with gains in economy and fewer rejections, were brought out in a discussion of problems that occupy the metallurgist of an automobile transmission plant, given at one of the sessions of the American Society for Steel Treating at Philadelphia recently by E. F. Davis, metallurgist of the Warner Gear Co., Muncie, Ind.

Mr. Davis said the two most commonly used steels in automobile transmissions are chromium steels of about 0.50 per cent carbon, and 3.5 per cent nickel steel in the carburizing grade. Steel with more than 0.55 per cent carbon is unsuitable for gears subjected to shocks and clashing. Although a larger carbon content gives a slight increase in hardness, the impact value of the steel drops rapidly with the increase in carbon content.

When steel with about 0.50 per cent carbon is rolled and then passed to the cooling beds, it cools rapidly and in consequence acquires considerable hardness. This is especially so in winter time when the temperature is low, in which case the hardness reaches from 300 to 400 Brinell. It is impossible to cold-shear such bars without producing enormous strains in the metal. If the steel is forged immediately the effect may not be injurious, but steel under such strains frequently cracks after a short period. Drop forgers usually limit cold shearing to bars of 1½ or 2-in. size, and use hot shearing for larger sizes, but the limit is determined more by what the shearing blades will stand than by what harm may be done to the steel. There is no trouble with the more ductile carburizing steels from strains set up by the shearing process.

There is still some disagreement as to whether orientation of grains by upsetting has sufficient merit to warrant the



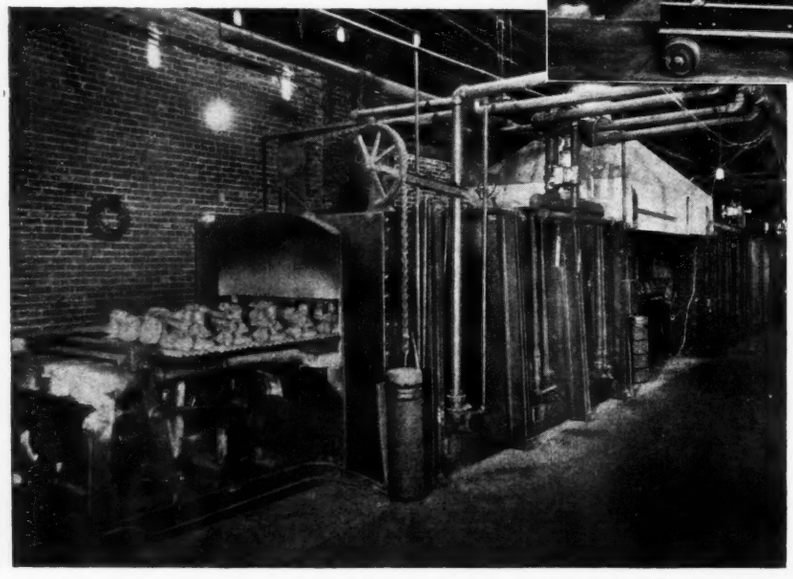


Fig. 1 (left)—Combination normalizing and annealing furnace train. The first furnace is for normalizing and the second for annealing. Note gap between furnaces for air-quenching of forgings after normalizing

Fig. 2 (above)—Front view of return-recuperative type carburizing furnace used for carburizing gears. Electrically heated and automatically controlled

practice, but the Warner company has always insisted on upsetting for all gears. Occasionally lots of steel are met with which show considerable growth parallel to the lines of grain flow and very little at right angles to it. If all gears are upset and these lines are dispersed radially, the ill effects are minimized, for no out-of-roundness can occur from this cause.

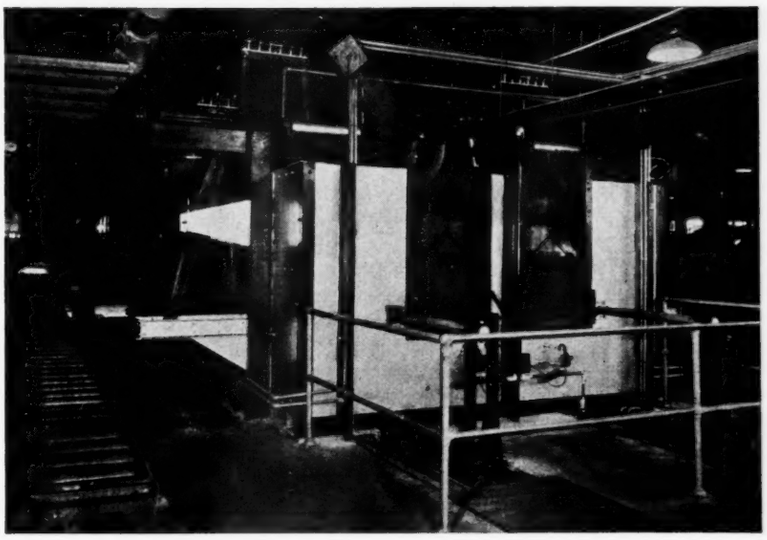


Fig. 3—Back view of return recuperative carburizing furnace, showing rear and side pushers

Another important advantage is the greater strength of the upset forging, partly due to the increased working and partly to better fiber distribution. Steel is usually 15 to 20 per cent stronger at right angles to the fiber than parallel to it. It is a recognized fact that gears made from bar stock are weaker than the same gear made from an upset hammered forging. The bar stock gear has the fiber lines parallel to the length of the tooth. Gears forged from slab stock have some of the teeth with fiber in this direction and some teeth at right angles to the fiber. But a gear is no stronger than its weakest tooth and the actual tooth strength of such a gear is not much better than the bar stock gears.

Small Size is Best

To insure ample working and upsetting, the smallest size which may be upset without buckling should be specified. Sheared ends should be square so that the upsetting action is equalized.

Better control of forging temperatures is steadily becoming more urgent. The ideal temperature for forging gears is the minimum heat which will produce a good forging properly filled so that it will finish at 1600 to 1700 deg. Fahr. If a forging is heated to 2200 deg. and finished at 2000 deg. it will be coarse-grained and overheated. If it is forged at 2300 deg. and finished at 1600 deg. a good forging will result. The less work there is on a gear forging, the lower the temperature should be for forging, but nearly all forging can be done at between 1800 and 2200 deg., with an average temperature of 2000 deg. Fast heats, freely oxidizing, are best, as the scaling rate must be faster than the carbon migration.

Considerable variations exist in any lot of forgings. Some have been forged hot, some comparatively cold; some have cooled faster than others, some have finished hot; some, perhaps, have been overheated and others finished at a low temperature. The micro-structure having been disturbed by heat, hammering, metal flow, and different cooling rates, it is in a more or less conglomerate condition. Since each forging has received individual treatment, it is natural to assume that all will not respond equally to any single heating and cooling cycle. Forgings subjected to heavy working and finished near the critical temperatures do not readily anneal, and ordinary annealing methods cause these to emerge from this operation in a semi-sorbitic condition unfavorable to good machining. Those which are coarsened by high temperatures and little working likewise respond sluggishly to thermal treatment.

In the Warner Gear plant, both carburizing and oil-hardening steels are normalized at 1750 deg., and normalizing is followed by a rapid cooling in air. It might be thought that with higher carbon steels, this practice would cause decarburizing and coarsening of structure, with an ultimate weakening of gear teeth, but actually none of these things occur. During the short period in the furnace the forging is decarburized only a few thousandths deep, and the time at heat is too short to cause any marked migration of carbon. The impact values on gear teeth have been improved and become more nearly uniform, and the coarse, dry fracture, indicative of weak teeth, has entirely disappeared since this treatment was introduced.

With the carburizing grades of steel the normalizing is prolonged, the object being to relieve all internal strains, so that no movement will occur in the subsequent carburizing operations. The cooling is actually so slow that the ferrite grains become coarser, but this is an advantage in that it makes the steel easier to machine. This is illustrated by the fact that in the bevel gear department cutter life was practically doubled after this treatment was introduced, and there was also less distortion. On some models straightening operations on ring gears were entirely eliminated.

The important thing in annealing is to have all of the forgings of the same microscopic pattern. Variations in strength, hardness and toughness of gear blanks produce differences in cutting results. If the gear blank is hard (sorbitic), it offers more resistance to cutting, and the gear cutters will not hold their edge but dull rapidly. If a gear blank is too soft it cuts roughly and accurate checking of the involute is difficult.

Results are Not Uniform

It is obviously impossible to obtain uniform results in any stationary furnace of sufficient size to handle forgings in production quantities. When forgings are annealed en masse the heating and cooling rate is not under control. Those on the outside of the pile heat and cool with greater rapidity than those on the inside.

The ideal way is to have the forgings pass through a series of heating and cooling zones maintained uniform by automatic pushing and fuel control, so that a definite mass of metal absorbs and loses a certain amount of heat per foot of travel. By changing the speed of travel or the temperature of any zone, any kind of structure may be obtained, and once the best machining structure is found, it can be as readily duplicated as any mechanical operation.

To achieve such results it is essential to control the

weight of forgings per tray. In the Warner continuous furnaces the trays are 3 ft. long and 1 ft. wide, and each carries 350 lb. of forgings, regardless of the shape or the mass of the individual forging. This permits steady burner action, and the same micro-structure is obtained in both large and small forgings.

Annealing Low Carbon Steel

Annealing of low carbon steel does not offer the problems of the oil hardening grade. Normalizing and annealing at 1500 deg. Fahr., and then air-cooling usually places this steel in the best machining state. Over-annealing and very slow cooling are apt to produce a tough, stringy condition not suitable for smooth finishing.

Much prejudice exists against the carburized gear, from a gear maker's standpoint, although the combination of a hard surface and a tough ductile core makes an ideal tooth for high impact, wear and strength. In fact, truck transmissions, which are subjected to heavy tooth load and much abuse, are still made of carburized steel, and substitution of oil hardening grades has seldom given satisfactory life. In passenger cars, where quiet running is paramount, the oil hardening steel predominates. In the past carburized gears have always been a source of much trouble to gear manufacturers in maintaining high standards for quality.

In addition, the carburizing operation has always been an expensive one, costing, usually, from 8 to 12 cents per pound. When oil hardening steels were introduced, capable of giving scleroscopic hardness of between 70 and 80 without excessive brittleness, the gear makers found not only relief from high manufacturing costs, but gear rejections were immediately lowered. On one model rejections for noise on the test stands dropped from an average of 20 per cent for carburized gears to less than 5 per cent with the oil hardening gears, and the transmissions all had a more even tone.

Other Reasons for Distortion

Among other reasons for the distortion of carburized gears besides treatment at high temperature may be mentioned failure to normalize the steel, indifferent annealing (or no annealing at all), and particularly crude carburizing practice. In gear carburizing plants the furnaces were nearly always of the box-type, usually hand-controlled, and temperature maintenance was dependent upon the alertness of the furnace tender (who often was not alert). Thermo-couples gave the temperature of the furnace blast, but gave no indication of what was transpiring within the boxes. Tests made in the Warner Gear laboratory indicated differences of 200 deg. Fahr. in a single heat in different parts of the furnace.

Metallurgists have long been aware of the shortcomings of the stationary furnace, but up to a few years ago no better equipment was available. Today, in the continuous furnace, boxes of standard size are pushed through zones of fixed temperature which are automatically controlled. By regulating the speed of pushing, any desired depth of case may be obtained within 0.005 in. Although variations in case depth do not produce differences in volume growth, differences in temperature of carburizing do cause enough variations to cause gear trouble.

Three types of furnace are in use at present, viz.: the rotary, the straight-through, and the counter-flow. The last type utilizes the radiant heat from the outcoming boxes to preheat those just entering. This furnace is suitable only for gears to be cooled in the boxes.

For metallurgical quality, quenching from the box is the best practice; but it ruins almost any gear from the standpoint of quiet operation, and this method is employed only if the factor of safety is low and the best metallurgical treatment is necessary, if a high standard of quietness is not essential, or if the tooth form is corrected by grinding after hardening.

A gear generated by modern methods is a marvel of mechanical accuracy, and if its tooth contour should be changed in heat treatment to show an error of 0.005 in. on the involute, it would be likely to chatter and be too noisy to pass the test. Hence, gear hardening calls for greater accuracy than the hardening of the finest tools, which usually are corrected by grinding.

Yet, in the operation of hardening the gear expands, passes through the phenomena of contraction at the critical temperatures and then expands again above it until at the moment of quenching it has become a soft plastic body with low strength and its original dimensions altered. Then while in this hot, enlarged condition it is suddenly plunged into oil and rapidly contracted.

Structure is Changed

The structure, by the heating and drastic cooling has been converted into new and harder bodies of different molecular arrangement, which did not exist when the gear tooth was generated. In addition to the changes within the mass, the surface has been exposed to oxidation and other active chemical influences from furnace gases. Yet in spite of all these internal and external agencies, apparently fatal to accuracy, gears are hardened in production by the thousands every day in which the errors on the involutes seldom exceed 0.0004 in.

All the common methods for hardening steel are employed in the heat treatment of gears. Immersion hardening in lead and salt baths is quite common. Also processes with pot, box and continuous furnaces using gas, oil or electricity. Each method has certain advantages and disadvantages, and no one of them is ideal.

It is the general opinion that steel must be slowly heated or distortion may result. This may be true when hardening heavy masses of metal or steel of low heat conductivity, but is by no means true as far as gears are concerned. Just as good gears may be hardened by a 10-minute immersion in molten lead, as an 1½ hour's soak in a pot or box furnace. But, it is important that a gear be uniformly heated and uniformly cooled and be so designed that extremely thick and thin sections are avoided.

The Hump furnace method, if properly applied and intelligently supervised, is one of the best processes for hardening gears in use today, but a lot of electrical, metallurgical, and mechanical attention is necessary to keep a battery of Hump furnace units functioning correctly. Even then, if the work is not proportioned right, the heating cycle may be very non-uniform in various gears. For example, if the bottom of the furnace were loaded heavily with gears, and there were none in the upper section, the gears on the top of the nest would heat much faster than those at the bottom, but the chart readings would show the conditions of the bottom gears only. Also, if the lower sections of the furnace were charged with a greater mass of metal than the upper, or vice versa, unequal heating would follow.

But the Hump furnace combines many advantageous features, such as lack of blasts, low oxidation, uniform heating rates and definite record of every heating cycle.

Although far from ideal as a production furnace this method is one of our most scientific developments in heat treating.

The necessity for harder surfaces than the oil hardening steel is capable of giving has caused many gear makers to go to some process of cyaniding the surface. This enables the gear maker to still employ the oil hardening steel and yet avoid the expensive carburizing method and its attendant troubles.

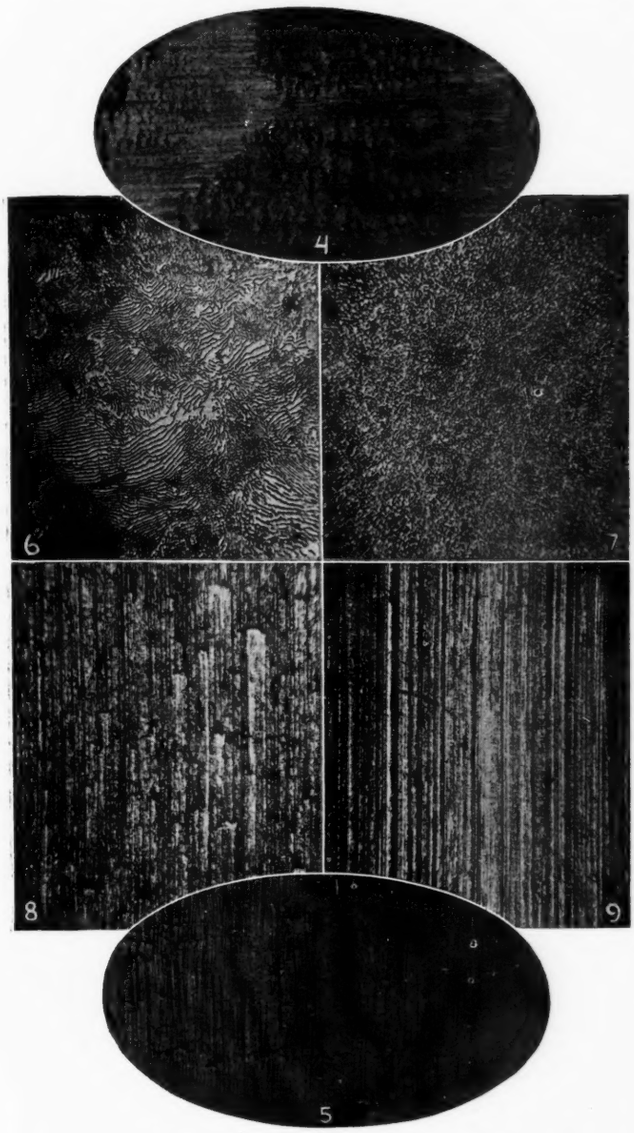


Fig. 4 (top)—Hobbed surface of gear tooth. Note tearing of surface. Fig. 5 (bottom)—Showing surface of gear tooth overstrained owing to excessive burnishing. Fig. 6—Showing lamellar pearlite in a 0.50 per cent carbon chromium steel. Brinell hardness 196. Fig. 7—Photomicrograph showing granular pearlite in a 0.50 per cent carbon chromium steel. Brinell hardness 196. Fig. 8—Rough-cut gear surface. The structure is lamellar pearlite. Fig. 9—Showing smooth-cut gear surface. The structure is granular pearlite

There are three variations of the cyanide method. The first is direct immersion; the second preheating to 900-1100 deg. Fahr. and completing the cycle in cyanide; the third is the cyanide dip after finishing the heating cycle in rotary or Hump furnaces.

Oil hardening steels, as a rule, increase slightly in volume in heat treatment, and if the entire heating is done in cyanide or after a preheat below the active oxidizing temperatures, this volume increase shows a tendency to minutely change the tooth contour to the plus side. With some types of driving gears this small deviation from the true involute aids considerably in producing quiet running units. Certain other gears will not operate quietly on the plus side, hence direct cyaniding under such circumstances is not an advisable procedure.

Reduction in Diameter

If, instead of direct cyaniding, the gears are heated in a Hump, rotary or other type of furnace to the hardening temperature and before quenching are given a cyanide dip of 1 to 1½ minutes, we obtain all the advantages of the cyanide plus the reduction in diameter due to oxidation in the furnace. The oxidation loss may represent 0.002 to 0.025 in. from the diameter, thus compensating for the normal volume increase of the steel in heat treatment. This method of cyaniding is, therefore, the best for maintaining the minimum volume change.

Many believe that cyanided gears are noisier than oil-hardened gears. This may or may not be true. Mars and bumps on cyanided gear teeth do not come off as readily as those on furnace-hardened gears, and these, of course, are bad noise producers. The mere fact that the cyanide surface is harder should not make the gears noisier. One particular model was changed from a Hump furnace hardening operation to a direct cyanide treatment. The first gears hardened were extremely noisy, but after the treatment was modified so that the benefits of oxidation were obtained by a combined furnace heating and cyanide dip, the job went along in excellent shape. Rejections actually declined 3 to 4 per cent until the termination of this model.

Sometimes it is the practice to cyanide only certain gears of a unit so that furnace hardening gears mate with cyanided gears. Under these conditions the former will wear better than if meshed with an oil-hardening gear. Destruction of tooth form is a mutual operation between mating gears, hence if one has an extremely hard surface it seems to prevent the development of wear in the other. Dynamometer tests indicate about 30 per cent better life under these conditions.

Lowers Impact Values

Cyaniding, however, has a tendency to lower impact values somewhat and is not recommended for fine-pitch teeth or teeth stressed close to the safety limit. It is the practice in some gear plants to lower the average carbon content of oil hardening steels 3 to 5 points when cyaniding is practiced to improve the impact.

Lead pot hardening is employed for carburized gears more frequently than for the oil hardening types. Owing to the high heat conductivity and rapid heat transfer, lead hardening is one of the best methods for certain types of gearing such as stem gears and pinions. But, like all other processes, it has certain objectionable features and some prejudice exists against its rapidity of heating. One of the worst troubles experienced in lead hardening is the removal of the lead, which frequently clings to the surface and is often difficult to take off. Also, if the lead is impure, decarburizing occurs at times producing poor wearing surfaces. Lead is heavier than steel, thus necessitating special fixtures to keep the gears fully immersed.

Double heat treatment of gears is always advisable from a metallurgical standpoint, because it produces the maximum tooth strength and ductility. If 3.5 per cent nickel steel is employed, the core refining heats can

be kept at a fairly low temperature, not much above the hardening heat of the oil hardening steels, but if chromium-vanadium or chromium-nickel steels are to be heat treated, this requires high refining heats of between 1550 and 1650 deg. Fahr. Such temperatures are the bane of the gear cutter by causing abnormal metal movement.

Eliminating High Quench

The tendency among gear metallurgists is to eliminate the high quench and slightly raise the case refining heat and obtain a partial core refinement at the expense of the case. This method, which is a compromise to aid the gear cutter, has been fairly successful because it does minimize to some extent the distortion resulting from the double treatment.

The quenching of gears is as important as the heating. A gear consisting of extremely thick and thin sections may be heated with the utmost care and uniformity but on quenching, the thin areas will cool to rigidity first, placing strains in the metal and thus causing distortion. This is, of course, a matter of unfavorable design for the heat treater. The only way such distortion may be overcome is by the use of rings and fixtures to falsely thicken up the sections which chill, or by milder quenching at the expense of the hardness.

In production hardening, mechanical quenching of gears is the usual practice, partly for labor economy and partly so that each will receive the same quenching action. Some of these devices consist of a rocker arm on the ends of which are suspended hooks. Others consist of long rods connected with an overhead crank. The movement of the crank gives an up-and-down motion to the rods. With both types the nests of gears, on removal from the furnace, are hung on the hooks and quenched in the oil at a rate of about 20 strokes per minute.

The purpose of a quenching oil is solely to remove the heat from the steel. Various quenching oils on the market show some differences in quenching rate. Usually the cheaper oils, such as the 28-deg. paraffines, are suitable for gear quenching. This, however, being a residual oil, is often imperfectly refined and liable to be highly acid or contain considerable water. Water is immediately discerned by excessive foaming and a muddy appearance of the oil. Water in oil causes soft spots, distortion and sometimes cracking.

Best Quenching Temperatures

Oil quenches gears best between 100 and 135 deg. Fahr. With the oil at 145 deg. Fahr. or over, an average loss of 1 point in scleroscope was noted. Too much refrigeration of quenching oil is also inadvisable. When the oil is below 65 deg. Fahr. about 2 points scleroscope hardness are lost. These remarks refer to the oil used by Mr. Davis' firm.

The tempering of gears does not develop any marked volumetric changes, but it does produce vital structural changes in the higher carbon steels. Tempering of oil-hardened steels is usually done at temperatures ranging from 400 to 475 deg. Fahr. This raises the impact value, at the expense of 2 to 3 points in scleroscope hardness.

Gear tempering is done in air, oil, or salts. Most air tempering furnaces are unsatisfactory, owing to irregularities in the air currents. This is especially true of air furnaces tempering by radiation, but even some of those using convection currents do not yield expected results.

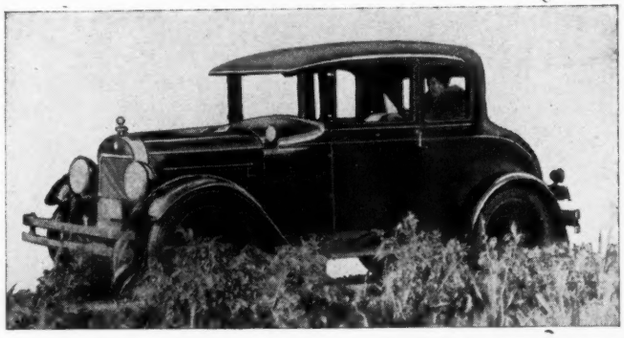
Mr. Davis prefers the immersion method of tempering, as with it the part is surrounded by a definitely heated mobile medium. In the Warner plant oil is used in a circular bath, electrically heated and automatically controlled. A large bull wheel rotates slowly over the bath, making a complete cycle in 38 minutes for oil hardening steel and 28 minutes for the carburized steels. The gears are hung by hooks on the rim of the wheel. The oil is agitated by means of a rotating propeller screw which keeps it in continual circulation and holds the temperature uniform within 5 deg. plus or minus.

In Hump furnace hardening, when the humidity of the air reaches 55 to 60 per cent saturation, it affects the furnace atmosphere, causing a peculiar attack on the tooth surface known as pitting. Steam from washing kettles in the vicinity of Hump furnaces, charging gears wet with cutting compound or water, also contributes to this condition. This pitting is really a local decarburization. Such gears are invariably noisy and poor in wearing quality. Bits of charcoal in the furnaces usually overcomes this trouble.

Some types of electric furnace produce a closely adhering scale, which is due to changes in the chemical composition of the oxides formed. This brushes off only with the greatest difficulty. Gears having this form of oxide are usually noisy. Copper plating or acid dipping are sometimes resorted to, to prevent this. Gears of the oil hardening grade plated with copper are not quite as hard as those not plated. Acid dipping must be done with the greatest caution, for any attack on the surface may ruin the tooth form.

Over-burnishing of gears results in overstrained tooth surfaces and causes abnormal crystalline development at points where the burnishing strains are greatest. This growth is actually very minute, but often enough to destroy the accuracy of tooth form. The fundamental purpose of burnishing is to remove roughness caused by cutting. Heavy burnishing to alter tooth form is always bad practice.

A New Detroit Electric



CONVENTIONAL body lines feature this new Model 99 electric car recently introduced by the Detroit Electric Car Co. It is equipped with an improved type of battery which gives a touring radius of about 125 miles to the charge and a speed range of 5 to 38 m.p.h.

THE Chicago Pneumatic Tool Co., 6 East Forty-fourth St., New York, which some years ago acquired the American rights to the Diesel engine developed by the Motoren Werke Mannheim (Benz), has placed on the market an engine known as the RH-40, which is made in two, three, four and six-cylinder types. It is not an automotive engine but is designed for either stationary or marine service. The power output is 40 hp. per cylinder at a governed speed of 327 r.p.m. Cylinders are separately cast.

Just Among Ourselves

Executive Personnel Constantly Shifting

KEEPING track of all that is going on in the way of thought trends as well as mechanical developments in this big automotive industry is quite a task. The task is big partly because of the really rapid growth and development that is taking place, but partly also because of the continued change in personnel among executives. This not-too-new thought was brought to our mind again yesterday when we had occasion to go through a file of letters received just two and one-half years ago in answer to a question on passenger car factory policies. The answers were in every case from someone high in the executive sales roster. Out of 19 letters seven of the writers still hold the positions which they held at that time; one more, E. T. Strong, has moved up to the presidency of his company.

* * *

Majority Still in the Industry

WHAT of the others? Well, one of them has since retired with the respect and admiration that properly belongs to one who has served his industry and his company with unusual vigor and success; that is O. C. Hutchinson. The writer of the second letter from the top of our pile moved first to another branch of the industry and now is out altogether—for the time being at least. The third has changed to an executive position of equal importance with another car manufacturer. The fourth has just taken over the airplane interests of his company. The sixth is out of the industry; the seventh is in an important executive position with an advertising agency; the eighth is out of the industry; the ninth has changed to another car company in an equally important capacity; the tenth is out of the industry, as is the eleventh and the twelfth. Out of the group, however, and out of the executive personnel as a whole, it is apparent that a fair proportion still are doing business in one or another part of the automotive field.

* * *

Losses Don't Curb Optimism

THIS old automotive business of ours seems blessed—or afflicted — with an incurable optimism which has furnished the driving power for doing every year at least five things that couldn't be done ever since its birth nearly 30 years ago. Just got through going over some confidential reports from a varied group of truck dealers which show pretty clearly that a good many of them have been losing money on used trucks in 1928 as well as in 1927, a few of them rather large sums. There seems to be a fair proportion, on the other hand, who are managing to make some money on their used vehicles, or at least break even. Just after the information regarding used truck sales, however, the question was asked, "How does 1929 look to you?" And the interesting thing is that out of a whole representative pile of letters, the outlook for 1929 is averred to be good, very good or excellent. The amount of money lost in 1927 and 1928 on over allowances bears no relation whatsoever to the attitude of the dealer as regards his belief in the brightness of the outlook for the coming 12 months. "Unsound thinking" our economic Old Scrooges may say . . . But it's the fighting spirit that has always built profit-making businesses, be they large or small.

Deeds as Well as Words on Commercial Bribery

HAIL to the man who not only talks about the need for improved conditions but who goes out and tries to do something about it. Along with the thoughts about Christmas cheer which permeate letters, writings and advertisements this time of year, there still creeps that sneaking old codger, Commercial Bribery. He's weaker than he was once by a good deal and he can't hold his head up in the best circles any more, but he still manages to sneak in here and there even in this fine, progressive automotive industry of ours. That being the case, we get a great kick out of a letter which is being sent out by D. F. Hulgrave, manager of Purchases, Cadillac Motor Car Co. Mr. Hulgrave doesn't even mention commercial bribery, but he . . . . well, here's what he does say; you can read it for yourself:

* * *

A Christmas Thought With a Real Meaning

THE letter goes to men and companies from whom Mr. Hulgrave's department has been buying goods. "Your name appears on our records of vendors," the letter runs, "with whom we have enjoyed business relations during the past twelve months. As such, we feel you would want to know that we support the discernible trend toward the elimination of the hardship worked on innumerable companies by the time-honored custom of remembering customers at Christmas time . . . . Our thoughts in this regard are that we appreciate our vendors having taken care of the business given them, and they have only to continue to do just that to merit our good will."—N.G.S.

World Conference Predicts

Experts representing 40 nations at Washington meeting visualize developments of future.

By H. L. Cobb

THE almost incredible advances made by aviation and aviators during the last 25 years will be dwarfed by the developments of the era into which the industry now is stepping. This seemed to be the almost unanimous opinion emanating from the International Civil Aeronautics Conference at Washington last week when delegates representing 40 nations met to discuss and study the past of aviation so that plans for the future might be laid on logical foundations.

The meeting, attended by diplomats and industrialists, scientists and flyers, business men and commercial experts, opened on Dec. 12 with an address by President Coolidge.

The President pointed out that all peoples are looking forward to the day of "extensive, regular and reasonably safe intercontinental and interoceanic transportation by airplane and airship." Perfection and extension of air transport throughout the world, he added, will be of the utmost significance to civilization. He dwelt upon the value of the airplane as a medium of promoting international amity.

After the President's address, 39 foreign nations and the United States, through their representatives, got down to the serious work of considering the paths along which this new baby giant in world affairs will stride in the future.

Among those working in the interests of the United States were Col. Charles A. Lindbergh, an official delegate, and Henry Ford, an unofficial visitor and observer. Mr. Ford made public his reaction to the conference in an interview along the following tenor:

"Although aviation has made tremendous progress during its 25 years of existence, it is confidently expected that the next 25 years will bring aeronautical achievements which will completely eclipse anything dreamed of today.

"There will be radical changes made in the design of airplanes and the airplane of tomorrow will bear small resemblance to the craft which are blazing the airways of the world today. The planes will grow larger and larger as the motors are improved and there can be no definite limit forecast as to the size which they eventually may reach.

"The small airplane for individual use has not yet been brought to the practicable stage. The practical airplane today and the one which is the foundation of our air transport progress is the multi-motored transport plane."

Mr. Ford denied that he has any intention at present of manufacturing any type of plane other than the model he is now building at the rate of one a day in Detroit. There is no foundation for rumors that he will manufacture or even consider manufacturing aerial "flivvers," he indicated. He said he would not be surprised to see the development of a combination of dirigible and airplane, or a "dirigible with wings" combining the most desirable features of both types of aircraft. The lift of gas cells, he pointed out, would mean economy of operation, while the use of wings would give added stability, speed and maneuverability.

The conference focused attention during one of the sessions on "freedom of the air" and its effect upon the development of international aviation. This subject occupied the same important position with the air industrialists that shipping men in years gone by ascribed to "freedom of the seas."

Air mail was discussed at one of the sessions while standards for safety occupied attention at another. Sectional meetings on various technical subjects were held and experts in various lines debated projects as to airways and aerial motors, commerce and trade in aircraft and air transportation.

The United States Delegation to the conference included Secretary of Commerce William F. Whiting, Assistant Secretary of State Nelson T. Johnson, Assistant Secretary of Commerce William P. MacCracken, Assistant Secretary of Navy Edward P. Warner, Joseph S. Ames, of Johns Hopkins University, Senator Hiram Bingham, Assistant Secretary of War F. Trubee Davison, Lester D. Gardner of New York, Assistant

(c) Henry Miller News Picture Service, Inc.

In the foreground, left to right: William P. Mac Commerce for Aviation; Pierre Etienne Flandin, ber of Deputies and vice-president of the Interna Charles A. Lindbergh and Orville Wright, surround perts who witnessed M. Flandin present Col. Lind aviation, awarded annually by the International voted to have done the most for aeronautics that between Col. Lindbergh and M. Flandin and was Civil Aeronautics Conference

Great New Era for Aviation

Postmaster General W. Irving Glover, Harry Guggenheim of New York, Col. Charles A. Lindbergh and Orville Wright, pioneer aviator, who was made the guest of honor of the conference.

Corporations from all parts of the world sent representatives to the conference also. All told, official and unofficial delegates numbered 124, while representatives of the aircraft industry numbering 250 were in attendance.

The sessions, after preliminaries were out of the way, heard of the progress of commercial aviation in Italy through a paper by General Italo Balbo, Under-Secretary of State for Aeronautics, representing the Kingdom of Italy. Another paper on "Economics of Civil Aviation in Germany" was read by Otto Merkel, director of German Luft Hansa, representing the Republic of Germany. Other papers at the opening session included one by J. A. Wilson, controller of civil aviation for Canada, in which he described the broad uses of airplanes in the Dominion for such purposes as exploration, forest patrol for fire protection and timber surveys, transportation of men and supplies, air photography for mapping, and general commercial projects.

Leighton W. Rogers, Department of Commerce, who acted as executive officer for the International Civil Aeronautics Conference

Cracken, Assistant Secretary of vice-president of the French Chamtional League of Aviators; Col. ed by world-famous aeronautic exbergh with the Harmon trophy for League of Aviators to the man year. The trophy can be seen awarded during the International at Washington

During the afternoon of Dec. 12 three sectional meetings were held. One on air transportation, was presided over by Lester D. Gardner, and centered attention on the progress of air transport in the United States and other nations; the second, over which F. Trubee Davison presided, dwelt upon the legal aspects attendant upon air transportation, while the third, over which Senator Bingham presided, discussed private flying, touring and competitions. Another meeting, presided over by Harry Guggenheim, discussed aerial photography and propaganda.

The second day of the conference opened with papers on airway development, under the chairmanship of Assistant Secretary of Commerce MacCracken. Special attention here was paid to the need for developing symbols, signs, abbreviations and ground marks on aviation charts to be adopted internationally or placed in actual internal use.

During the afternoon of Dec. 13 three sectional meetings were held during which operation and technical matters relating to aerial transportation, airway development and aeronautical research were analyzed.

The entire morning of Dec. 14, the closing day of the conference, was devoted to a discussion of trade in aircraft and engines, and its development and control. During the afternoon several technical sessions took up the scientific sides of air transportation and airway and airport development.

The vast contribution to scientific literature as a result of this conference will not be fully appreciated, it is believed, until the papers presented at the various sessions by experts have been carefully analyzed and compiled, but persons well informed as to the effect of such papers indicate that the conference, if for no other reason than that of acting as a clearing house for the discussion of problems, national and international, has been crowned with success.

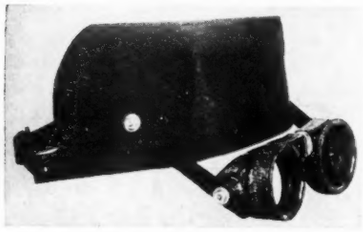
Celebration at Kitty Hawk

Large groups of the delegates, as soon as the sessions were over, left for Kitty Hawk, N. C., scene of the Wright brothers' first flight. Ceremonies commemorating this event were held on Dec. 17, with Orville Wright as the center of attention.

Col. Lindbergh shared honors with Mr. Wright at the general conference. At the close of the second day's plenary session, Pierre Etienne Flandin, vice-president of the French Chamber of Deputies and an official of the International League of Aviators, made the presentation of the Harmon Trophy to Col. Lindbergh. This trophy, a gift of Clifford Harmon, founder of the International League of Aviators, is given annually to the man voted to have done most for aeronautics during the year immediately preceding. In making the presentation, M. Flandin declared: "It is an added pleasure to do this in the presence of Orville Wright and to pay tribute to the magnificent work done by America's sons in the conquest of the air."

NEW DEVELOPMENTS—Automotive

Welding Goggles



ACCESSORIES for welding and cutting recently added to the line of the Oxweld Acetylene Co., 30 E. Forty-second St., New York, include Oxweld cap and skeleton type helmet goggles. The cap goggles consist of a strong fiber cap to which a pair of goggles are attached by fiber links. The goggles can be readily raised over the forehead or lowered with one hand. The bridge is adjustable and covered with rubber insulation.

Replaceable lenses are used, the colored lenses being protected by cover lenses of clear glass. The skeleton type goggles are the same except that they are fastened to a lattice skeleton cap.

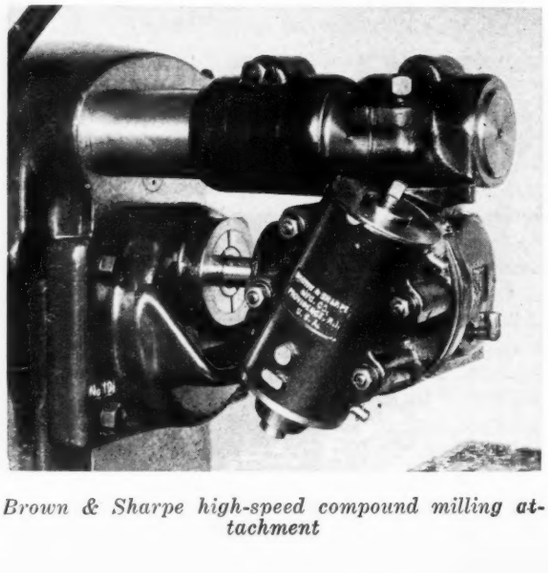
Vertical Spindle Attachments

BROWN & SHARPE MFG. CO., Providence, R. I., has added three vertical spindle attachments for milling machines which have been especially designed for high-speed work. They are designated the No. 10 high-speed vertical spindle; the No. 10 high-speed compound vertical spindle and the No. 10 high-speed universal milling attachments.

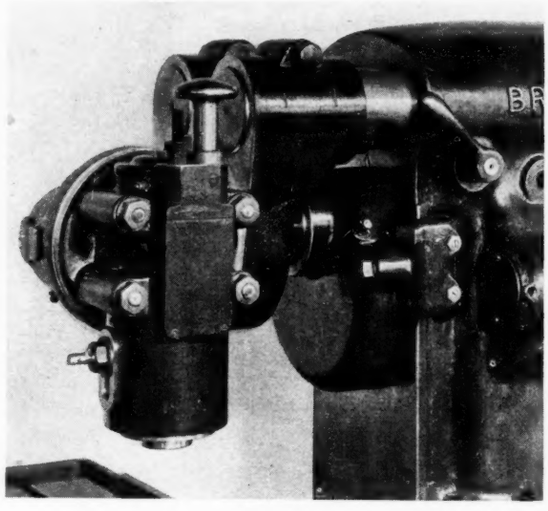
The high-speed vertical spindle milling attachment is designed for manufacturing jobs where it is desirable to raise the spindle to clear the cutter from the work to facilitate loading or for milling slots, keyways, etc. The spindle is always in a vertical plane and has a hand adjustment of 2½ in.

The high-speed compound milling attachment is similar in design to regular Brown & Sharpe compound attachments with the exception of the high spindle speed feature. It is used where it is desired to set the spindle in a plane at right angles to the table for milling angular strips, table ways, etc. With the spindle in this position the full length of the table travel is available and an ordinary end mill can be used.

Full universal movement for such work as drilling, milling angular slots and surfaces, cutting racks, milling dies, molds and intricate tool work is obtained by using the Universal attachment. This is also provided with a hand feed adjustment of 1½ in. for use in angular boring or for setting end mills into the work.



Brown & Sharpe high-speed compound milling attachment



High-speed universal milling attachment

Turner Seat Adjuster

THE Turner Manufacturing Co., Kokomo, Ind., has brought out a new type of seat adjuster for coaches and two-door sedans. It consists of malleable castings which are attached to the floor with a sliding shoe which permits the seat to be shifted either backward or forward through 5 in. A rotating arm also permits the seat back to be tilted.

Adjustment can be made without getting out of the seat; by loosening two large thumb screws at the side the seat can be moved either forward or backward. Two models are offered, one for Ford Tudor sedans and another for Chevrolet, Oldsmobile, Pontiac, Oakland and Chrysler coaches.

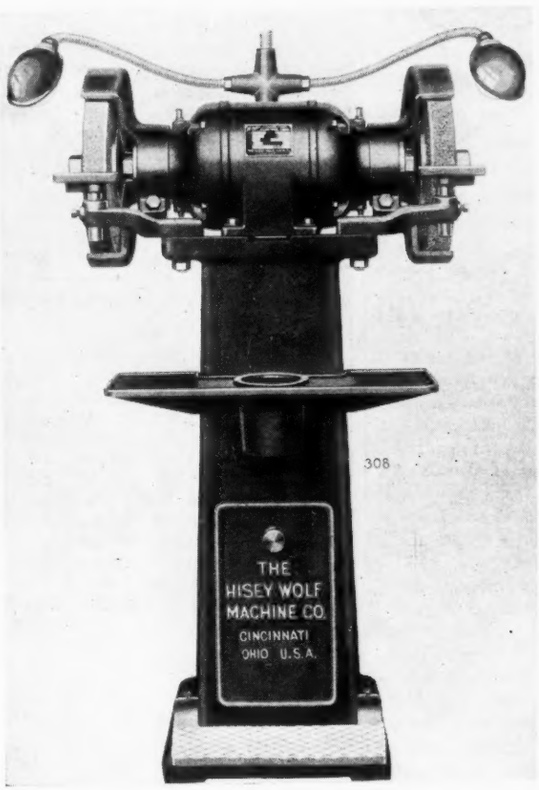
Hisey-Wolf Accessories

TWO new accessories have been added by the Hisey-Wolf Machine Co., Cincinnati, Ohio, both designed

Parts, Accessories and Production Tools

to add to the operating convenience of Hisey motor-driven buffing and grinding machines. The first, a foot-treadle switch, is automatic in operation and assures the current being turned off whenever the operator leaves the machine. The treadle extends the entire width of the column and permits simultaneous operation by two workmen without interference with each other.

The second new feature is an automatic light control. The lights are connected with the machine in such a way that they are on only while the machine is running, the lights being turned off or on automatically with the motor control switch.



Foot-treadle control switch on Hisey-Wolf grinder

Polyphase Ammeter

ROLLER-SMITH CO., 233 Broadway, New York, has brought out a type HEA-3 polyphase ammeter which is specifically designed for use on three-phase alternating current circuits and by means of which simultaneous readings may be taken in each of the three phases of the circuit. With this arrangement it is possible to determine instantly whether the phases are properly balanced.

The long 7⅛-in. scale and the much less space required by this instrument than by three individual instruments are additional features of the new development.

Ames Amplifying Comparator

THE new Ames amplifying comparator developed by B. C. Ames Co., Waltham, Mass., compares measurements of round, flat or odd-shaped parts and enlarges, in its dial, one ten-thousandth to nearly 3/16 in. and one-thousandth to nearly 1½ in.

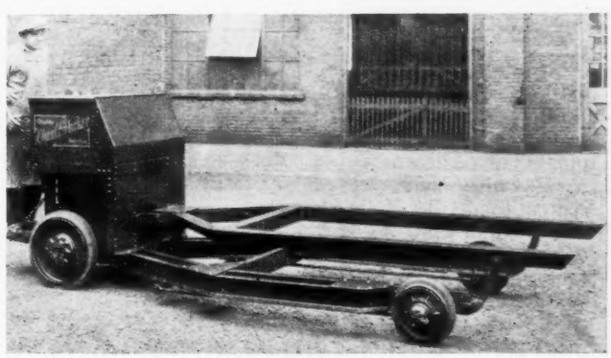
Ames amplifying comparator

Size block measurements are transferred with the comparator to parts being measured, the sensitivity of the instrument permitting such comparisons to be made with great accuracy. The most delicate setting can be locked securely in place and the rigid construction of the instrument prevents spring and false dial readings while the work is being tested.

Minute variations from zero, plus or minus, are registered on a fan-shaped scale with a sweep of 4 in. whose entire range is only from 1/1000 in. plus to 1/1000 in. minus. Size variations to 0.000025 in. can be detected with this instrument. Its measuring capacity is 8 in., its total height 16 in., and its weight 70 lb.

Tructor for Car Bodies

THE Elwell-Parker Electric Co., Cleveland, has developed a new type of tructor for handling automobile bodies. It is built on a standard Elwell-Parker frame with a special type of lift mechanism hook-up to raise the upper frame which contacts with the body supporting dolly frame. The welded lift frame is carried on three U-links with the lift mechanism attached to the third link which is raised to an upright position when the load is lifted 22 in.



Elwell-Parker special body tructor

First with the News

Reliable and Accurate

News of the Industry

PAGE 914 VOLUME 59 *Philadelphia, Saturday, December 22, 1928* NUMBER 25

Operations Continue High Despite Holiday Season

PHILADELPHIA, Dec. 22—Steadily increasing production by manufacturers introducing new models, with a generally high rate of output being maintained in practically all car and truck factories, gives promise of bringing the December total in excess of the 300,000 mark. Intervention of the holiday season will have probably less effect on factory operations than in any year in the industry's history.

Demand for deliveries of new cars has fallen to the low point of the year, so much so that Ford dealers in many parts of the country are able to make immediate deliveries though still carrying large banks of orders for deliveries after Jan. 1. Much of the selling in all lines during December is for delivery after Jan. 1 resulting in some accumulation of new car stocks. These, however, give promise of being quickly dissipated as the new year opens and dealers are urging acceptance of immediate deliveries to avoid delays which the new year may entail.

Displays of new cars in advance of the 1929 shows continue to attract large attendances. A high rate of sales is accompanying these showings, one manufacturer having received orders covering at least two months' production with indications that a much larger back log will be built up as the showings continue.

Hahn and Selden Merge, Both Lines to Continue

ALLENTOWN, PA., Dec. 20—Merger of the Hahn Motor Truck Corp. and the Selden Truck Corp. has been effected to centralize control and to bring about an expansion of the sales of the two companies. Under the plan Hahn and Selden trucks will continue to be manufactured in their respective plants at Allentown and Rochester, N. Y., with body and cab operations centralized at the Hahn plant.

The Hahn company is a development of a carriage and wagon business founded in 1900 at Hamburg, Pa., by W. G. and A. G. Hahn. Manufacture of trucks was started in 1908. In 1926 the Hahn business was merged with Bethlehem Motors Corp. of New York, and the Lehigh Co. of Allentown, as the Hahn Motor Truck Corp. The company has a modern plant with 175,000 sq. ft. of manufacturing space.

Production Exceeds 1926 Peak by 30,000

WASHINGTON, Dec. 19—November production of cars and trucks in the United States and Canada totaled 268,705 as compared with 415,632 in October and 140,987 in November, 1927, according to Department of Commerce report. Production for the first eleven months of 1928 totaled 4,357,182 as compared with 3,443,703 for the 1927 period and 4,327,673 in 1926.

United States plants produced 217,256 cars and 39,680 trucks in November, as compared with 339,976 and 57,120, respectively in October, 1928; and 109,758 and 24,612 in November a year ago.

Car production in United States factories for the 11-month period totaled 3,621,469 for the 1928 period as compared with 2,840,518 a year ago; while United States truck production in the 1928 period totaled 502,756 against 427,237 in 1927.

G. M. November Sale 91,410

NEW YORK, Dec. 18—November sales by General Motors Corp. dealers totaled 91,410 as against 140,883 in October and 80,539 in November last year. Sales by divisions to dealers in November totaled 47,587 against 120,876 in October and 57,621 in November, 1927. A. P. Sloan, Jr., president, said division sales were affected by Chevrolet and Pontiac being out of production.

Discuss New Merger

CHICAGO, Dec. 20—Directors of Hershey Corp., Houdaille Corp. and Oakes Products Corp. are expected to meet late this week to consider consolidation of the three companies The companies are headed by C. L. Barnes.

11 Months' Output Rises to 4,357,182

	Cars	Trucks	Total
1928			
Jan. ..	212,351	27,840	240,191
Feb. ..	301,466	34,834	336,300
Mar. ..	387,044	43,752	430,796
Apr. ..	385,394	48,921	434,315
May ..	405,627	54,098	459,725
June ..	381,963	43,232	425,195
July ..	358,914	58,388	417,302
Aug. ..	424,867	67,676	492,543
Sept. ..	375,444	61,034	436,478
Oct. ..	352,992	62,640	415,632
Nov. ..	225,410	43,295	268,705
Total..	3,811,472	545,710	4,357,182
1927			
Jan. ..	211,395	42,889	254,284
Feb. ..	278,997	44,393	323,390
Mar. ..	365,754	52,009	417,763
Apr. ..	379,572	51,421	430,993
May ..	380,716	50,640	431,356
June ..	297,090	45,935	343,025
July ..	246,530	33,853	280,383
Aug. ..	285,724	36,796	322,520
Sept. ..	235,124	36,448	271,572
Oct. ..	189,278	38,152	227,430
Nov. ..	114,931	26,056	140,987
	2,985,111	458,592	3,443,703
Dec. ..	108,317	28,360	136,677
Total..	3,093,428	486,952	3,580,380

Allied Motors Industries Names Wilson President

CHICAGO, Dec. 18—William Robert Wilson heads the new Allied Motors Industries, Inc., as president it was announced today. Allied Motors is the holding company for the Henney Motor Co. of Illinois, Weatherproof Body Co., Great Lakes Aircraft Corp. and the newly organized Van Sicklen Corp.

Other officers of Allied Motors are N. H. Van Sicklen, Jr., vice-president; E. R. Naar, secretary and treasurer, and E. Q. Krutchen, assistant secretary and assistant treasurer. Directors include Mr. Wilson, Mr. Van Sicklen, Mr. Naar, J. W. Henney, H. M. Robins, George W. Mason, Arthur I. Philip, Charles C. Dawes and Harry C. Watts.

De Soto Output 45,000

DETROIT, Dec. 20—De Soto Motor Corp. has closed for inventory after shipping 45,000 cars in the six months that the company has been in operation.

Sloan Views 1929 Setting New Record

Increased Replacements and Exports to be Factors in Coming Year's Business

NEW YORK, Dec. 20—Regarding the motor car outlook for 1929, Alfred P. Sloan, Jr., president, General Motors Corp., in a special statement said: "My viewpoint so far as 1929 is concerned is necessarily predicated upon what I believe to be a fact, viz.: that there is nothing except soundness in the general economic and industrial situation, therefore, I see no reason why we should not continue to progress and enjoy excellent business and a generous measure of prosperity. It is quite generally understood, I believe, that the automotive industry is an important factor in contributing to our industrial activity and I am certain we can rest assured that this particular industry will do its share in that direction in the forthcoming year. This means, expressed otherwise, that I believe the production of motor cars will reach a satisfactory total. As a matter of fact, I look forward to a new record being established.

"I reach this conclusion because I believe that the statistical position of the automotive industry indicates that sales during 1928 were limited by lack of production in the low price field, which means that we will carry forward a certain amount of business into 1929 which will, of course, be in addition to the normal trend. The normal trend will call for increased production due to the increased replacement demand over previous years plus increased demand from overseas markets which are expanding very rapidly, plus a reasonable amount of natural growth, all of which should swell the total to a point where I believe a new record for production will be established.

"I appreciate that when any motor car manufacturer expresses an opinion of still new records in production, the question arises in many minds as to how much farther the industry can expand. We must remember that the life of any motor car is necessarily limited from the standpoint of both depreciation and obsolescence. The number of cars in daily use has increased tremendously for many years past and each year we therefore pick up an increased replacement demand. The increase in the number of cars per family is also a contributing factor and, as I have before stated, I do not think any of us have any real appreciation of what can be acomplished in the development of our overseas business."

Handy Acquires K.P.

DETROIT, Dec. 17—The Handy Governor Corp. announces completion of negotiations by which it has acquired full ownership of the K. P. Products Co., of New York. Engineering and manufacturing activities of the consolidated corporation are being centered at the Handy plant here. Officers have been chosen as follows: President, Arthur A. Bull; vice-president and secretary, S. W. Farnsworth; treasurer, W. G. Wetherby, and vice-president, W. F. Lowe.

Industry to Follow Hearings on Tariff

NEW YORK, Dec. 20—More than a score of industries will seek upward revision in tariff schedules in the next general tariff bill according to indications at trade organization headquarters here. The automotive industry, however, will not be numbered among these and will not participate in the hearings before the House Ways and Means Committee unless something unforeseen develops. Arrangements have been made by the National Automobile Chamber of Commerce and the Rubber Association of America to keep posted on developments.

There is possibility that the Rubber Association may become active in the hearings but this would be in the case of developments affecting certain rubber goods not allied with the automotive industry.

The National Council of American Importers & Traders have adopted a resolution asking that all witnesses appearing before the House committee be placed under oath.

Among the industries which have signified their intentions of asking for tariffs or upward revision of existing tariffs are shoe, cement, common brick, cotton, woolen, metals and tobacco. Sentiment in the wood and leather industries is mixed, the former not desiring to affect existing relations with Canadian lumber interests.

New Black & Decker Unit to Add 40,000 ft. of Space

TOWSON, MD., Dec. 19—Black & Decker Mfg. Co. will proceed at once with the erection of a new factory building which will add 40,000 sq. ft. of factory space to present facilities. Completion is expected by mid-summer. Net sales of the company and its Canadian and British subsidiaries increased 17½ per cent this year, and with the sales of Van Dorn Electric Tool Co., another subsidiary, the sales increase was 47 per cent. The quarterly dividend on the common stock has been increased from 25 to 30 cents a share.

Wrench Business Merged

SPRINGFIELD, MASS., Dec. 19—Bemis & Call Co., manufacturer of wrenches, has purchased the wrench business conducted for many years by the Coes Wrench Co. of Worcester and beginning Jan. 1 will consolidate production of the two lines in this city. The product will be sold through J. C. McCarty & Co. of New York.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES.

NEW YORK, Dec. 20—Despite the stock market shake-up of two weeks ago, trade continues on a sound basis. Holiday trade is progressing very favorably, while there is evidence of the usual seasonal slowing up in wholesale lines.

DEPARTMENT STORE SALES

Average daily sales of 462 department stores reporting to the Federal Reserve Board in November show a seasonal increase over the preceding month and were in about the same volume as in the corresponding month last year, according to preliminary reports.

POWER CONSUMPTION

Industrial consumption of electrical energy reported by the Electrical World in November indicates a new high peak of manufacturing operations for the year. Industrial consumption of electricity in that month was 2.2 per cent greater than in October and 17.2 per cent higher than in November, 1927.

FREIGHT CAR LOADINGS

Car loadings in the week ended Dec. 1 amounted to 899,786 cars, which, as a result of the Thanksgiving holiday, represents a decrease of 128,904 cars under the total for the preceding week.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended Dec. 15 stood at 96.8, which compares with 97.1 the week before and 97.3 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City for the week ended Dec. 12 were 17 per cent above those in the similar week a year ago.

FEDERAL RESERVE REPORT

The consolidated statement of the Federal Reserve banks for the week ended Dec. 12 shows increases in discounted bills of $16,200,000, of $16,600,000 in holdings of bills bought in the open market, of $8,700,000 in holdings of Government securities, and of $26,600,000 in member banks' reserve deposits. The reserve ratio on that date was 64.2 per cent, which compares with 64.8 the week before.

Stockholders See New Jordans

CLEVELAND, Dec. 18—Stockholders of Jordan Motor Car. Co. were given a preview of the new Jordan lines which will be introduced at the New York show. The new cars are a six and an eight as heretofore. All of the 1928 cars have now been sold and the factory is preparing for the new car output. The increase in the company's stock from 200,000 to 300,000 shares was approved by the stockholders.

Brown Lipe Bought by Unit Corporation

Company Will Continue Under Present Name and Same Management

MILWAUKEE, Dec. 18—Unit Corp. of America has announced the acquisition of Brown Lipe Gear Co. of Syracuse, N. Y. According to Unit Corp. plans, the company will be operated as a subsidiary under the Brown Lipe name and with the present personnel.

Control of the Brown-Lipe company was held by the Alexander T. Brown and the W. C. Lipe estates. Among the minority stockholders was Arthur C. Parsons, who was treasurer and general manager previous to his sudden death in November. The company is in no way connected with the Brown-Lipe-Chapin Co., division of General Motors Corp., though both companies were organized by the same group of Syracuse business men.

With the purchase of Brown Lipe, Unit Corp. is now made up of four important producers of automotive equipment. In April this year the company acquired Fuller & Sons Mfg. Co. of Kalamazoo, and in December, 1927, acquired the plants and businesses of Dallman Machine & Mfg. Co., Milwaukee, and the Obenberger Forge Co., West Allis, Wis. Products of the subsidiary companies include gears and transmissions, dies and forgings.

Officers of Unit Corp. are: W. H. Schmidt, president; E. W. Edwards, vice-president; G. C. Moerschel, treasurer, and P. O. Dallman, secretary. Directors include the officers and J. A. Carson, K. J. Heinzelman and P. W. Cleveland.

Borg-Warner Plans Deals, to Triple Common Stock

CHICAGO, Dec. 15—Consolidation of the Galesburg Coulter Disk Co. with the Borg-Warner Corp. was agreed upon at a meeting of directors of the two companies yesterday. Preliminary to this and other transactions now contemplated, the directors of Borg-Warner will call a special meeting of stockholders for Dec. 31 to vote on increasing the authorized common stock from 500,000 to 1,500,000 shares. Terms of the merger provide for the issuance of one share of Borg-Warner stock in exchange for each share of Galesburg.

No details have been made public as to the purpose of the increase in stock beyond that immediately required. At the present time Borg-Warner has 410,000 shares of common stock outstanding and 100,000 shares additional will be required for the exchange of Galesburg shares, making a total of 510,000 shares to presently be outstanding, when the present consolidation is consummated. It is stated that absorption of other companies is now in process of negotiation and may be announced shortly.

Borg & Beck Gets Gardner Order

CHICAGO, Dec. 17—An order for 2000 clutches has been placed with Borg & Beck Mfg. Co. by Gardner Motor Co. to be used in the new series eights recently announced. It is expected that this supply will fill Gardner requirements for approximately the first quarter of 1929.

Gardner Plans Marketing 2000 Cars in 1st Quarter

ST. LOUIS, Dec. 19—Russell E. Gardner, president of Gardner Motor Co., foresees a brilliant year for the company in 1929. He said:

"Gardner Motor Co. production will reach the 4000 mark for 1928, thereby establishing a new record for this company, and the management feels confident of a successful first-quarter in 1929 and expects to market approximately 2000 cars during that period. In 1927, the company produced 3685, 3478 in 1926, and 2985 in 1925.

"Our records would indicate that there will not be on Jan. 1 an average of over 1 to 1½ automobiles per dealer on hand unsold in the entire country, so that any volume in consumer business will immediately be reflected in factory shipments."

Auburn Schedules 1800

AUBURN, IND., Dec. 15—Auburn Automobile Co. built 850 cars in November and has scheduled a December production of 1800. The company reports receipt of 3000 orders since the new lines were announced and the signing of six distributors and 100 dealers.

Auto-Lite Acquires Columbus Auto Parts

Will Operate Company as Subsidiary Continuing Management Under Klages

TOLEDO, Dec. 18—Electric Auto-Lite Co. today acquired control of the Columbus Auto Parts Co., maker of tie rods and drag links for steering mechanism of motor cars, and will continue to operate the $1,500,000 subsidiary under its present management headed by R. E. Klages, Columbus.

The company was organized in 1912 and built a new plant last year tripling its capacitiy. In connection with the purchase a banking syndicate in which Hemphill, Noyes & Co., New York; Collin, Norton & Co., Toledo, and R. V. Mitchell & Co., Canton, are members, offered Wednesday an issue of 50,000 shares of no par convertible cumulative preference stock carrying a dividend of $2 a year, selling at $30.50 and redeemable at $33, convertible into common on a share for share basis.

Auto-Lite owns 51 per cent of the common of which there will be 100,000 shares outstanding. It also guarantees the preference dividend for five years.

It was announced here that the gross sales of the Auto-Lite this year would run $38,000,000 as compared with $23,000,000 last year, and estimates for the coming year based on orders for the first quarter are $60,000,000. Company will earn $8 to $8.50 a share on its 890,000 shares of common this year, it is indicated.

Overseas Club Hears Grez on South America, Gilbert on Europe, and Sammamn on China

NEW YORK, Dec. 15—The extent of the market in China was depicted today at the regular monthly meeting of the Overseas Automotive Club by Paul E. Sammamn, manufacturers' representative in Shanghai. Conditions of travel and the wide area to be covered were the principal themes of Mr. Sammamn's talk.

James L. Gilbert, vice-president of the Business Publishers International Corp., who has just returned from a trip to Europe, described the European automobile market as the most competitive in the world. Manufacturers of replacement parts and shop equipment, he said, should observe two rules in order to cultivate this market to the best advantage. First, they should be represented either by their own representative or by manufacturers' agents who could be relied upon to forward their interests in placing their goods with the proper wholesale houses. Second, these representatives should be amply supplied with stock so that there need be no delay on delivery of goods as wanted.

Alfonso Grez of Chile and New York presented a picture of the South American market showing the opportunities there and the advances that have already been made. The average South American, he pointed out, has a natural aptitude for mechanics and with proper training develops into a good mechanic.

P. A. Karl of Brunner Mfg. Co. was reelected to his second term as president of the club; P. F. Baillet, foreign sales manager, was reelected first vice-president, and George Tiffany of the Overseas Motor Service Corp. was elected second vice-president. Mr. Tiffany replaces E. C. Steinacher of the Moto Meter Co., Inc., who has resigned.

George E. Quisenberry was elected secretary, and R. C. Thompson of Prest-O-Lite Storage Battery Sales Corp. was elected treasurer, replacing James P. Kane of Kane Bros., who resigned. Jay S. Tuthill was reelected assistant secretary and assistant treasurer.

The annual show meeting of the club, it was announced, is to be held Thursday night, Jan. 10.

Many Ford Dealers Cut Delivery Delays

General Availability of Cars Believed Partly Due to Seasonal Conditions

PHILADELPHIA, Dec. 17 — Additional reports from leading centers on Ford delivery conditions indicate that generally dealers are able to make deliveries on most models within a week to 10 days and that in some sections immediate deliveries may be had if desired. This is believed partly due to the disinclination of many buyers to accept December delivery. In other sections, notably Cincinnati; Washington, D. C., and New York, one to two months' delays are continued.

Sectional reports from special *Automotive Industries* correspondents follow:

Detroit—Some dealers delivering any body type except two-door sedan within week. Other dealers taking orders subject to two weeks' delay.

Chicago—Some dealers making all deliveries immediately except on truck chassis. Other dealers have orders on all types one to four weeks ahead.

Kansas City — Deliveries on all types available within a few days from most dealers where desired. Four-door sedans most delayed.

Washington, D. C.—Open models and coupes subject to 10 days' delay in majority of cases. Other models one to three months. Two-door sedan seems to be most delayed.

New York—Dealers figure on two months' delay for two-door sedans; slightly under for other models. Trucks most available.

Philadelphia — Open models and coupes usually available for immediate delivery. Trucks, one week on the average; two-door sedans, one to eight weeks; four-door sedans, one to two weeks.

Denver—Trucks, open models and coupes generally immediate delivery. Four-door sedans, 10 days to two weeks; two-door sedans, two to four weeks.

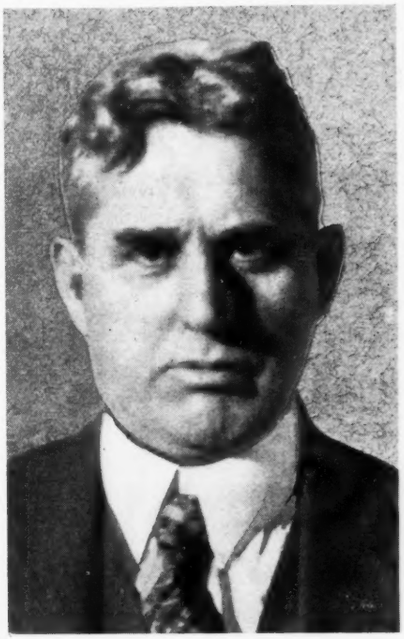
Minneapolis — Three days maximum wait on any model, two-door sedan most in demand.

Cincinnati—Delay of two to three weeks on coupes, other passenger car models 60 to 90 days. No definite promise on trucks in most cases.

Buffalo — Delivery of nearly any passenger car model is being made by most dealers within a week. Truck deliveries are being made in 30 days.

San Francisco—Deliveries of passenger cars by practically all dealers delayed 30 to 90 days though some deliveries of open models are being made in less than one month. Trucks are being delivered in two to three weeks.

Dallas — Delivery of Ford cars in the Dallas district varies from spot delivery on some models to 30 days on others, dealers report. Truck deliveries are being made in 10 to 45 days.



Joins Bendix

David Beecroft, former Chilton Class Journal vice-president, now vice-president of Bendix Corp.

VanSicklen to Add New Automotive Products

CHICAGO, Dec. 15—The board of directors of the new VanSicklen Corp., formerly the Elgin Clock Co., includes N. H. VanSicklen, Jr., who has been named president; E. R. Naar, Chicago banker; G. E. Meyercord, president of the Meyercord Company and the Haskelite Company; William Robert Wilson, chairman of the Great Lakes Aircraft Corp., and president of the new Allied Motor Industries, Inc., successor to the Henney Motor Co.

All of the common stock of the VanSicklen Company is owned by Allied Motor Industries, Inc., which also controls the Henney Motor Co. of Illinois, Weatherproof Body Co., and the Great Lakes Aircraft Corp.

The new VanSicklen Company plans continuance of the products of Elgin Clock Co., which includes automobile clocks, and smoker and vanity sets for automobiles. The company will also branch into allied lines. The present sales and production organizations will be continued, Mr. VanSicklen said. New contracts have recently been obtained from Hudson Motor Car Co., Graham-Paige Motors Corp. and Pierce-Arrow Motor Car Co.

Western Metal to Build

MILWAUKEE, Dec. 17 — Western Metal Specialty Co., manufacturer of sheet metal parts, has placed contracts for an addition to its plant and for a new office building. This addition will permit of a 25 per cent increase in manufacturing facilities and will be the third the company has made within a year.

Beecroft is Named Bendix Executive

Becomes Vice-President of Corporation With Offices in New York

NEW YORK, Dec. 18—David Beecroft has been appointed a vice-president of the Bendix Corp. with offices in New York. Resigning recently as vice-president of the Chilton Class Journal Co., Mr. Beecroft rounded out 25 years of service in the automotive business paper field, during which time he became known as an important factor in the industry.

In 1902 Mr. Beecroft was editor of the *Automotive Review* and in 1904 became assistant editor of *Motor Age*, succeeding to the editorship later. When Class Journal Co. was formed by the late H. M. Swetland, Mr. Beecroft was made director of editorial policies. He served in this capacity for several years and was later made business manager of *Motor Transport* and still later a vice-president of the company.

With Mr. Swetland, Mr. Beecroft was a foremost figure in the organization of the Society of Automotive Engineers and served as president of the society in 1921. He has been active in the affairs of the society and in many other automotive organizations, notably the American Automobile Association, serving on the contest board and on special traffic committees.

Car-by-Car Broadcast Packard Electric Plan

WARREN, OHIO, Dec. 17—Packard Electric Co. has completed arrangements for broadcasting a description of the cars displayed at the New York show over a chain of 28 stations of the National Broadcasting Co. The broadcasting will take place from 9:30 to 10 P. M. on Jan. 5 and 7 with Ray W. Sherman, editor of *Motor*, at the microphone. All car manufacturers are requested by Packard Electric to furnish them with a brief description of new features of their models. Packard Electric is featuring the broadcast through its newspaper advertising and through posters.

M. & E.A. November Index Shows Recession to 153

NEW YORK, Dec. 20—Motor & Equipment Association reports a grand index of 153 in November against 188 in October and 102 in November last year. By divisions the indexes showed original equipment 163 against 200 in October and 99 in November, 1927; replacement parts 149 against 184 in October and 132 November, 1927; shop equipment 122 against 141 in October and 143 November, 1927, and accessories 78 against 91 in October and 75 November, 1927.

Men of the Industry and What They Are Doing

Rockne and Kaltenborn N.A.C.C. Dinner Speakers

Speakers for the dinner of the National Automobile Chamber of Commerce, to be held Jan. 8, were announced today. H. V. Kaltenborn, associate editor of the Brooklyn Daily Eagle and radio speaker on current affairs, will speak on "Around the World With American Business." During the course of the dinner, Knute Rockne, coach of the Notre Dame football team, will speak on "How Team Work Pays." After the dinner, Neal O'Hara, newspaper columnist, will speak, giving some of his observations on motor business and other matters.

McCornack Leaves Hudson

Resignation of O. H. McCornack as vice-president in charge of sales activities of the Hudson Motor Car Co. is announced with regret by President R. B. Jackson. The resignation becomes effective Jan. 1, and, according to a statement issued by the company, Mr. McCornack will devote the future to directing his large personal interests and will travel extensively.

During the past 19 years Mr. McCornack participated in developing the company's policies, has shared in its growth and prosperity and has contributed much to establishing Hudson in the high position it holds in the automotive industry.

McCord Appoints Whitten

McCord Radiator & Mfg. Co. announces the appointment of F. A. Whitten as chief engineer, effective Dec. 15. He will occupy the position vacated by J. D. Harris, recently advanced to executive engineer. Mr. Whitten was for eight years chief engineer of the General Motors Truck Co. and during the past two years has been chief engineer of the American Car & Foundry Motors Co.

Martin Joins Hayes Body

Frank J. Martin, formerly director of purchases of Durant Motors, Inc., at Elizabeth, N. J., has been appointed director of purchases of the Hayes Body Corp., Grand Rapids, succeeding Frank J. Thrall, who has resigned. Mr. Martin was formerly connected with Chevrolet Motor Co. and has been connected with the industry for 13 years.

Bombay Dealer Seeks Lines

Chimanlal Desai, Bombay agent for automobile parts and accessories, is at present visiting in this country with a view to studying American business conditions and to acquiring a number of additional lines for his market. Mr. Desai operates branches in Calcutta, Madras, Lahore, Rangoon and Colombo.

With Hupp

Former Graham-Paige and Dodge sales executive, now sales manager of Hupp Motor Car Corp.

Tipper Visits European Plants

Harry Tipper, general sales manager of General Motors Export Co., sailed Dec. 15 for Europe to visit operations in London, Paris, Berlin and Antwerp. Mr. Tipper will return the latter part of February to be in America for the managing director's conference of the General Motors Export Division which will bring together all of the directing heads of General Motors overseas operations. W. C. Brumble, assistant manager of the general manufacturing division, returned from Germany, Dec. 10. Mr. Brumble has been in Berlin for the last six months working on a special project at General Motors G.m.b.H.

Hersh Sales Promotion Head

Appointment of H. G. Hersh, advertising manager of Auburn Automobile Co., to sales promotion manager, has been announced by the company. This department has recently been created and will be operated in connection with the advertising department.

Reeves Addresses Dealers

Alfred Reeves, general manager of the National Automobile Chamber of Commerce, spoke Dec. 19 at Binghamton, N. Y., before the dealers of Larabee-Deyo Motor Truck Co. at its annual meeting. He discussed the motor transportation of the future.

Mason With Kelvinator

George W. Mason, formerly president of Copeland Products, Inc., has been elected a director, chairman and general manager of the Kelvinator Corp.

Mott Chairman of Board in Flint Bank Combine

As a result of a merger of the Industrial Savings Bank and the Union Trust & Savings Bank at Flint, Charles S. Mott, vice-president of General Motors Corp., becomes chairman of the board of the largest banking institution in Michigan outside of Detroit. Previous to the merger Mr. Mott was chairman of the board of the Industrial Savings Bank, which he founded. The capital, surplus and profits of the new bank will be more than $3,000,000. The merger also includes general assets of more than $30,000,000.

Besides Mr. Mott, other men associated with the automotive industry, who are members of the board of directors of the two banks are: Charles F. Barth, vice-president in charge of production, Chevrolet Motor Co.; Walter P. Chrysler, chairman of the board of the Chrysler Corp.; Cady B. Durham, vice-president of the Buick Motor Co.; J. R. Francis, president, Marvel Carburetor Co.; Robert T. Longway, comptroller Buick Motor Co.; Harvey J. Mallery, vice-president, Buick Motor Co.; E. T. Strong, president, Buick Motor Co.; C. E. Wetherald, general superintendent, Chevrolet Motor Co., and R. J. Whiting, general manager, Fisher Body Plant at Flint.

Hugh Lyons Makes Promotions

S. S. Newell of Chicago, Western sales manager for Hugh Lyons & Co., of Lansing, has been appointed general sales manager for the commercial truck body and display fixture divisions. Peter H. Featherly of Lansing, formerly with Hugh Lyons & Co., in Chicago and Iowa territory, has been appointed Western manager to succeed Mr. Newell in Chicago. B. A. Moore, formerly cost accountant and auditor, has been promoted to production manager and general factory superintendent for both truck and fixture divisions.

Brockway Appoints Townsend

Ray F. Townsend has been appointed manager of corporation sales of Brockway Motor Truck Corp. For five years he was connected with the general sales office of the Willys-Overland Co. and subsequently was a special representative for five years with Federal Motor Truck Co. Later he became assistant to the president of Indiana Motor Truck Corp., in charge of branch operations.

Chapin and Mayo Directors

Roy D. Chapin, chairman of the board of Hudson Motor Car Co., and William B. Mayo, chief engineer of Ford Motor Co., have been elected directors of the recently organized North American Aviation Corp.

Carpet Supersedes Linoleum at Show

11,000 Yards Ordered of New Floor Covering—Chandeliers from Europe

NEW YORK, Dec. 18—New departures are to be featured in the decoration of Grand Central Palace for the coming national automobile show. In place of the linoleum of former years the floor will be covered with 11,000 yd. of specially woven rich brown carpet.

The pillars on the main floor will be covered with brocaded damask of greenish-gold hue. The Corinthian capitals at the top of the columns will be of gold while the base will be paneled with rich molding. Open spaces between the pillars on the main floor are to be spanned by ornamental arches covered with the same damask material.

Two mammoth chandeliers, designed and executed in Czechoslovakia especially for this show and containing 4500 crystal pendants, will hang over the central court on the main floor. These chandeliers are 12 ft. high, 6 ft. in diameter and contain 150 lights each.

Car exhibits will be divided by Italian upholstery seats in place of the former fences or partitions. The various exhibits will be designated by electrically lighted signs in which the name will appear in opal glass letters. Two mural paintings, symbolic of progress in the automotive industry, will decorate the lobby at the main entrance on Lexington Avenue. The walls will be hung with woven tapestries on wood paneling.

Trade Tickets in Demand

NEW YORK, Dec. 18—Demand for trade day tickets for the New York automobile show indicates a larger dealer attendance at this show than ever before.

Four additions to the accessory list for the Chicago show and one for the New York show have been announced by the show management, i.e., for Chicago: Texas Co., Chicago; Cellucraft Co., Chicago; Universal Monogram Co., Chicago; and Allen Electric & Equipment Co., Kalamazoo, Mich. For New York: The Auto Signal Co., Long Island City, N. Y.

Chevrolet Deliveries Dec. 29

DETROIT, Dec. 22—Chevrolet Motor Co. dealers in all parts of the country are scheduled to have 1929 cars on display Dec. 29 with deliveries beginning at once. The Kansas City assembly plant is to go into operation next week, bringing the number of Chevrolet assembly plants in this country to nine. This plant will have a capacity of 350 cars a day.

Forms Aviation Division

NEW YORK, Dec. 18—The Moto Meter Co., Inc., has organized an aviation division for the manufacture and sale of aircraft instruments. This division, which will be headed by Henry Boynton, will manufacture and sell the recently announced ice warning device, fuel pressure gages and a number of aircraft instruments now being built by the National Gauge & Equipment Co., subsidiary of Moto Meter. Sales will be through the regular Moto Meter dealer organization.

Sloan, Mott and Chrysler Republic Brass Directors

NEW YORK, Dec. 15—Republic Brass Corp. has been formed here this week to combine six leading brass manufacturing companies having assets of approximately $39,000,000. Barton Hazelton, now president of Rome Brass & Copper Co., will be chairman of the board of the new company, and G. P. Allen, now president of the Michigan Copper & Brass Co. will be president. The automotive industry is represented on the directorate by A. P. Sloan, Jr., president of General Motors Corp.; W. P. Chrysler, president, Chrysler Corp.; and C. S. Mott, vice-president of General Motors.

The companies in the deal are Rome Brass & Copper Co., Rome, N. Y.; Michigan Copper & Brass Co., Detroit; Taunton-New Bedford Copper Co., with mills in those cities; Dallas Brass & Copper Co., Chicago; Higgins Brass & Mfg. Co., Detroit; and the Baltimore sheet mill of the General Cable Corp. American Smelting & Refining Co., will have a substantial interest in the new company through stock ownership in the Michigan Brass & Copper Co.

Propose Parking Garages to End N. Y. Congestion

NEW YORK, Dec. 15—The specially organized traffic committee of the Automobile Merchants Association of New York, Inc., headed by C. B. Warren of the Warren-Nash Motor Corp. and president of the association, has recommended to Mayor Walker the erection in congested sections of New York City of large automobile garages and the use of available plots of ground for parking purposes, following which ordinances could be adopted prohibiting all street parking in the congested areas.

Record Crowds See Whippet

TOLEDO, Dec. 15—Willys-Overland officials here announced that record establishing crowds viewed the new Whippet line on the first two days it was shown in principal dealer centers throughout the country. The plant here is increasing production and will be making 1000 cars a day in January, according to schedules.

Gabriel Uses Chromium Plating

CLEVELAND, Dec. 22—Adoption of chromium plating for the new Gabriel "Triple-Hydraulic" shock absorber was announced today by George H. Ralls, president of the Gabriel Snubber Mfg. Co.

Financial Notes

United States Rubber Co. has made an offer of 728,412 shares of common stock, no par value, with rights to stockholders of record Dec. 21 to purchase this new issue on the basis of one share of new for each share of old held. These rights, which entitle present stockholders to purchase the new stock at $35 a share, expire Jan. 11, 1929. This will give the United States Rubber Co. a total outstanding stock or 1,456,824 shares out of a total authorized issue of 2,000,000 shares. This stock was recently changed from $100 par value to no par value stock.

Foote-Burt Co., Cleveland, is offering a new issue of 42,437 shares of common stock at $40 per share. This stock, with government securities now owned by the company, will be used to retire the outstanding first mortgage 6 per cent bonds and 7 per cent preferred stock. A portion of this offering represents common stock purchased from individuals. This financing provides no additional capital for the business but is for the purpose of retiring senior securities and simplifying the capital structure.

Peerless Motor Car Corp. in its statement as of Sept. 30 shows total assets of $9,111,931 as against $10,862,565 on Sept. 30, 1927, and profit and loss surplus of $890,420 against $2,942,502. Current assets were $4,991,214 and current liabilities $857,849, comparing with $6,637,311 and $824,040 at the end of September, 1927. Cash totaled $1,860,107 against $2,900,012 and inventories $2,866,932 against $3,405,456.

Firestone Tire & Rubber Co. reports net profit for the fiscal year ended Oct. 31 as $7,072,014 after all charges. This is equivalent to $14.66 a share on common stock after payment of preferred dividends and compares with $13,780,965, or $33.89 a share, in the preceding year. The reduction in net profits is attributed to the loss in inventory resulting from the removal of the Stevenson restriction act,

E. I. duPont deNemours & Co., Inc., stockholders have authorized the issue of 15,000,000 shares of common stock with a par value of $20 each in place of the present authorized issue of 5,000,000 no par shares. The outstanding common stock amounting to 2,811,050 shares will be exchanged for the new stock at a ratio of 3½ new shares for each of the former.

Hart-Parr Co. of Charles City, Iowa, reports net profit for the year ended Oct. 31 after all charges as $1,190,072, equivalent to $11.53 a share on common stock after the payment of preferred dividends. This compares with net profit of $527,396, or $5.28 a share, on common stock for the previous fiscal year.

Chicago Pneumatic Tool Co. has called a meeting of stockholders for Dec. 31 to vote on a plan of reorganization which provides for the present capital of 94,000 shares to be changed into new preferred and new common stocks.

Marlin-Rockwell Corp. has declared regular quarterly dividend of 50 cents and an extra dividend of 50 cents both payable Dec. 31 to holders of record Dec. 22.

Industry Continues High Working Level

Employment in November Shows Minor Curtailment —Some Overtime Noted

WASHINGTON, Dec. 15—Some curtailment in operations was noted in the automobile industry during November although a high level of employment was maintained, according to data assembled by the Department of Labor in its monthly survey of the employment situation throughout the country. No serious curtailment was noted by the department's advisers in any locality.

Reports summarizing the situation in automotive industrial centers include the following:

Michigan—General: The automobile and allied industries reported satisfactory operations. Detroit: A small surplus of automobile factory labor was apparent; two large factories here, however, operated overtime with additional shifts. Grand Rapids: Plant making automobile bodies and plants manufacturing automobile accessories are working overtime indefinitely; except in automobile and allied plants, local industries were on part time basis in November, creating surplus of labor. Flint: One large automobile factory closed temporarily during November but surplus of workers were mostly reemployed early in December.

Wisconsin—General: Automobile factories reported satisfactory operating schedules. Racine: Large automobile factory discontinued most of its night force. Kenosha: Automobile factory discontinued night shift.

Ohio—General: Tire factories operated on satisfactory schedules with large forces, skilled and unskilled, employed. Akron: Larger rubber plants worked overtime.

New York—General: Automobile industry operated on slightly curtailed schedules; this is seasonal; full forces again expected in 30 days. Buffalo: Seasonal decreases reported in two automobile factories; normal schedules expected again in December; one automobile plant engaged additional workers.

Ohio Employment Off 6 Per Cent

COLUMBUS, Dec. 17—The Bureau of Business Research of Ohio State University in an advance bulletin covering employment in the vehicle manufacturing industry in Ohio, including automobiles and automotive parts for November, shows employment 6 per cent less than in October this year and 38 per cent greater than in November, 1927. Of the 63 reporting concerns 39 showed decreases from October, 23 showed increases and one showed no change. Employment during the first 11 months of the year was 7 per cent greater than during the corresponding period in 1927.

Biflex Pump on Duesenberg

WAUKEGAN, ILL., Dec. 20—Biflex Products Co. announces that the new fuel pump which it recently developed has been adopted for use on the Duesenberg Eight. The pump is of the syphon type.

British Car Market Maintains Activity

WASHINGTON, Dec. 15—An increase in the activities of all branches of the automotive industry and especially on light cars and light-weight motorcycles in the United Kingdom is reported by cable to the U. S. Department of Commerce. The Morris Co. at the present time is producing an average of 2000 units per week, and the Austin Company 1100. Sales of popular makes of American cars were well maintained, with some distributors having more orders than they can fill. Future prospects of all branches of the automotive industry are especially encouraging, the cable states.

Motor Truck Association Favors 6-Wheel Vehicles

NEW YORK, Dec. 17—The program of the Motor Truck Association of America for the coming year includes opposition to the imposition of a gasoline tax in the State of New York and opposition to the enactment of compulsory motor vehicle accident insurance laws, according to an outline given out by Theodore P. Pratt, manager of the association, at its annual meeting held in the Hotel McAlpin.

The association also went on record as favoring six-wheel trucks for heavy loads instead of four-wheel vehicles as a move to reduce the axle load on highways.

E. P. McDowell, transportation manager of the Hecker-Jones-Jewell Milling Co., was reelected president of the association. Other officers were: Vice-Presidents, Hermann Irion, Steinway & Sons; Roderick Stephens, Stephens Fuel, Inc., and Joseph Husson, Eleco Co.; Secretary, C. M. Billings, Vacuum Oil Co., and Treasurer, Nat Mallouf, Mallouf Haulage & Maintenance Corp.

Power Officials Elected

PHILADELPHIA, Dec. 17—W. H. Fisher of T. B. Woods Sons Co., Chambersburg, Pa., has been reelected president of the Power Transmission Association; L. H. Shingle, Shingle Gibb Leather Co., treasurer, and the following vice-president and members of the executive committee: F. H. Willard, B. A. Keiley, W. R. Simpson, F. L. Curtis, S. A. Ellicson, W. K. Lee, E. D. McKown and R. C. Ball.

Sheridan Confines Territory

CHICAGO, Dec. 17—Richard M. Sheridan Co., manufacturers' representative, is discontinuing activities in the West and Southwest after Jan. 1, and will travel only in Central states.

Nine Ohio Counties Show Sales Decline

November Deliveries Total 7587 Against 8983 in October—N. J. Sales 5959

COLUMBUS, Dec. 17—The Ohio Council of the National Automobile Dealers Association in a recent bulletin announces that sales of new cars in nine of the most populous counties in Ohio during November were 7587, compared with 8983 in October, a decline of about 16 per cent.

Cuyahoga County, containing Cleveland, had 2209 sales in November and 2591 in October; Hamilton County, containing Cincinnati, 1272 sales in November and 1440 in October; Summit County, containing Akron, 764 sales in November and 880 in October; Lucas County, containing Toledo, 746 sales in November and 842 in October; Franklin County, containing Columbus, 920 sales in November and 1150 in October; Mahoning County, containing Youngstown, 436 sales in November and 595 in October; Stark County, containing Canton, 479 sales in November and 581 in October; Montgomery County, containing Dayton, 637 sales in November and 701 in October, and Scioto County, containing Portsmouth, 124 sales in November and 203 in October.

N. J. November Sales 5959

NEW YORK, Dec. 17—New car registrations in New Jersey for November totaled 5959, according to Sherlock & Arnold, and compare with 3230 for the same month in 1927. This also compares with 7977 for October of this year. Total sales for the first eleven months of 1928 were 103,747 and compare with 92,284 for the first eleven months of 1927.

Chicago Sales Off 8.2%

CHICAGO, Dec. 17—October sales of new cars in the Chicago Federal Reserve District fell off 8.2 per cent from September but were 76.8 higher than in October, 1927. Used car sales showed an increase of 12.7 per cent over September and of 27.1 over October, last year. New car stocks increased 7.9 per cent over September and were 21.4 per cent higher than the year previous. Used car stocks increased 2 per cent over September and 11.8 over the year previous.

German Registry Up 29%

WASHINGTON, Dec. 20—Registration of automobiles in Germany during the 12 months' period from July 1, 1927, to July 1, 1928, increased 29 per cent, according to cable to the U. S. Department of Commerce. Total registration as of Jan. 1 this year was 422,300—or one automobile for every 148 inhabitants.

75,000,000 Tire Output Estimated in 1929

Production of 4,800,000 Motor Vehicles Figures in Coming Year's Program

AKRON, Dec. 17—It is estimated by a careful check through the country's rubber plants that 75,000,000 pneumatic tire casings will be made in 1929. It is agreed that the year 1929 will be by far the greatest in the history of the industry and it should be one of the most stable and prosperous. The industry enters the new year on the soundest economic basis it has enjoyed in a decade. Mergers of several great companies are believed imminent, among those reported figuring in the negotiations being Goodyear, Seiberling and U. S. Rubber.

The most gratifying feature of the year has been the tire industry's splendid display of stamina in withstanding the severest blow it has ever received—the end of British rubber restriction—and its remarkable ability to survive the heaviest and sharpest liquidation ever recorded in its annals, and to stage an amazing recovery.

Minimum of 4,800,000 motor vehicle production is figured for the year by automotive experts. This will mean a substantial increase in original equipment busines. Export markets should take 3,000,000 tires. A 5 to 6 per cent increase in the replacement market is figured for next year. These figures mean an almost certain market in 1929 for more than 75,000,000 American made tires.

Build 30,000 Daily on Coast

LOS ANGELES, Dec. 17—Total daily production of the Firestone, Goodyear, Goodrich and Samson tire factories in this city has reached 30,000 tires and 35,000 tubes, bringing the aggregate annual value of their products to $225,000,000 and making this for the first time one of the largest tire-manufacturing centers of the country. These four factories represent a total investment of more than $25,000,000, and maintain 8000 employees, who receive an annual payroll of $14,000,000.

Firestone Western Plant Opened

LOS ANGELES, Dec. 15—With Russell A. Firestone, second son of Harvey S. Firestone, and J. W. Thomas, of Akron, executive vice-president of the parent Firestone Company officiating, the new $7,000,000 western Firestone factory was formally opened in Los Angeles this week.

The Western factory now has a productive capacity of 5000 tires and 7000 tubes per day but announcement was made during the opening ceremonies that additional equipment has already been ordered to bring the capacity to 7500 tires and 9000 tubes per day.

The local plant produces for the entire Western third of the United States, where there are more than 3000 dealers, and also ships to overseas Pacific countries.

The factory here uses 1,300,000 pounds, or 650 tons, of crude rubber per month and 400,000 pounds of fabric. The rubber is brought direct into Los Angeles from Singapore, where the company maintains its own crude rubber preparation plant.

Vogt Offers Stock

CHICAGO, Dec. 17—Public participation in the Vogt Mfg. Corp., upholstery manufacturers, under private control since its inception about 35 years ago, will be made possible soon through an offering of a large block of the stock by George H. Burr & Co. This offering does not represent new financing on the part of the company, but consists of stock purchased from individuals in connection with the acquisition of the George R. Carter Co.

Factory and Dealer Events Scheduled for National Show Weeks

NEW YORK SHOW				
Jan. 5	Studebaker Corp.	Dinner	7.00 P. M.	Commodore
Jan. 5-12	Hupp Motor Car Co.	Luncheons	12.45 P. M.	Commodore
Jan. 5-12	Locomobile Co.	Meetings	2.00 P. M.	Commodore
Jan. 7	Oakland Motor Co.	Dinner	6.30 P. M.	Penna.
Jan. 7	Rubber Association	Meeting	10.30 P. M.	Commodore
Jan. 7	Rubber Association	Dinner	7.00 P. M.	Commodore
Jan. 7	Amer. Auto. Assoc.	Meeting		Waldorf
Jan. 7	Nat'l Automobile Dealers Assoc.	Convention		Commodore
Jan. 7-8	Packard Motor Co.	Meetings		Roosevelt
	(Exclusively for Packard Distributors)			
Jan. 8	Auburn Auto. Co.	Luncheon	1.00 P. M.	Commodore
Jan. 9	Reo Motor Car Co.	Dinner		Hotel Astor
Jan. 9	Chrysler Sales	Luncheon	12.30 P. M.	Commodore
Jan. 9	Warren-Nash Motors	Luncheon	12.30 P. M.	Penna.
Jan. 9	Automotive Elec. Association	Meeting	10.00 A. M.	Hotel Astor
Jan. 9	Peerless Motor	Dinner	6.30 P. M.	Commodore
Jan. 9	Gardner Motor Co.	Luncheon	1.00 P. M.	Belmont
Jan. 10	Willys-Overland	Dinner	7.00 P. M.	Commodore
	(Admittance by card only)			
Jan. 11	Chevrolet	Meeting	1.30 P. M.	Mecca Temple
Jan. 11	Chevrolet	Banquet	6.30 P. M.	Mecca Temple
CHICAGO SHOW				
Jan. 25	Chicago Auto Trade Association	Dinner	6.30 P. M.	Palmer House
Jan. 26-Feb. 2	Locomobile Co.	Meeting	2.00 P. M.	Blackstone
Jan. 26-Feb. 2	Hupp Motor Co.	Luncheons	12.45 P. M.	Stevens Hotel
Jan. 28	Studebaker	Dinner	7.00 P. M.	Palmer House
Jan. 29	Oakland	Dinner	6.30 P. M.	Palmer House
Jan. 29	Auburn	Luncheon	1.00 P. M.	Stevens
Jan. 29-30	Auto. Elec. Assoc.	Meeting	10.00 A. M.	Stevens
Jan. 30	Chrysler	Luncheon	12.30 P. M.	Congress
Jan. 30	Peerless	Dinner	6.30 P. M.	Congress
Jan. 30	Willys-Overland	Dinner	7.00 P. M.	Palmer House
	(Admittance by card only)			
Jan. 31	Reo	Dinner		Congress
Feb. 1	Chevrolet	Meeting	1.30 P. M.	Majestic Theater
Feb. 1	Chevrolet	Banquet	6.30 P. M.	Palmer House
Jan. 28-29	Nat'l Automobile Dealers Assoc.	Convention		Palmer House
Jan. 28-29	Packard Motor Co.	Meetings		Blackstone
	(Exclusively for Packard Distributors)			
Jan. 29	Nat'l Automobile Dealers Assoc.	Banquet		Palmer House
Jan. 30	Gardner Motor Co.	Luncheon	1.00 P. M.	Blackstone

Federal Aid Road Fund Increased to $82,000,000

WASHINGTON, Dec. 20—The Agricultural Departmental appropriation bill, carrying a total of $143,148,047, of which $82,000,000 is for Federal-aid highways and forest roads, passed the House this week. The 1929 appropriation for Federal-aid is $3,500,000 over the appropriation for 1928, the increase being to permit certain Western States, having public lands, to complete their highway projects linking up the Federal-aid system.

Change Hearse Designation

SPOKANE, Wash., Dec. 18—Hearses are being licensed this year as private cars with a capacity of one person. Under the old classification they were known as "pleasure cars" but there was much unfavorable comment. The average hearse is licensed for around $35 and many of them are seldom on the roads.

3 Companies Merge in United Aircraft

New Company Joins Pratt & Whitney, Boeing and Chance Vought

NEW YORK, Dec. 17—United Aircraft & Transport Corp. has been organized as a holding company, consolidating the interests of Boeing Airplane & Transport Corp., Pratt & Whitney Aircraft Co. and Chance Vought Corp. This new company, backed by the National City Co. and the Pacific National Bank of Seattle, will control securities having an estimated market value in excess of $150,000,000.

Included among the directors of the new corporation, in addition to prominent figures in the aircraft industry, are: C. F. Kettering, vice-president of General Motors Corp.; W. B. Mayo, chief engineer of Ford Motor Co., and a number of bankers in both Eastern and Western cities.

By this consolidation are brought together the Boeing Airplane Co., of Seattle, one of the largest airplane manufacturers in the West; Chance Vought Corp., manufacturer of airplanes in Long Island City; Pratt & Whitney Aircraft Co., manufacturer of the Wasp and Hornet air-cooled engines; Boeing Air Transport, Inc., which has the air mail franchise between Chicago and Los Angeles, and the Pacific Air Transport, which has the air mail franchise between San Francisco and Seattle.

The new corporation will own all the stock of the Pratt & Whitney, the Boeing Airplane Co., the Boeing Air Transport, Inc., Chance Vought, and more than 70 per cent of the stock of the Pacific Air Transport.

2,500,000 Shares of Common Stock

Authorized capitalization includes 1,000,000 shares of 6 per cent preferred stock at $50 par value and 2,500,000 shares of common stock. Capitalization to be presently outstanding will approximate $12,000,000 par value of preferred stock and about 1,500,000 shares of common stock.

Acquisition of stock in Pratt & Whitney is to be accomplished through the issuance of approximately 2¼ shares of common in the United Aircraft & Transport for one share of Niles, Bement, Pond. Common stock in Chance Vought, is to be acquired in the same way. Preferred and common stock of Boeing Airplane & Transport will be exchanged share for share for securities in the new corporation.

W. E. Boeing, president of Boeing Airplane & Transport, will be chairman of the board of United Aircraft & Transport; F. B. Rentschler, president of the Pratt & Whitney, will be president; Chance Vought will be vice-president, and C. W. Deeds will be secretary and treasurer. In addition to these, the board of directors will include the following:

Col. E. A. Deeds, director of the National City Bank; P. G. Johnson, president of Boeing Air Transport, and of the Boeing Airplane Co.; C. F. Kettering, K. R. Kingsbury, president of the Standard Oil Co. of California; C. K. Knickerbocker, vice-president of the Griffen Wheel Co. of Chicago; W. B. Mayo, George J. Mead, vice-president and chief engineer of Pratt & Whitney; Gurney E. Newlin, attorney of Los Angeles; G. S. Rentschler, assistant to the president of the National City Bank; J. P. Ripley, vice-president of the National City Co., and O. W. Tupper, secretary and treasurer of the Boeing Airplane & Transport.

Both the Boeing and the Chance Vought concerns have used the Pratt & Whitney aircraft engines extensively in their planes and Boeing and Vought planes have been used as test planes for Wasp and Hornet engines at the Hartford airport.

Production of Pratt & Whitney engines has been constantly increased during the last year and a monthly output of 200 engines is expected by the beginning of the year. The present plant has been enlarged almost to capacity of available space to keep pace with the increased production.

Olds Resumes Operations on Full Production Basis

DETROIT, Dec. 17—The Olds Motor Works, which have been closed down for annual inventory and for the installation of new machinery, making possible greater production facilities for next year, resumed operations today on a full production basis. The company has scheduled a production of 3500 cars for December which will bring Oldsmobile's output for the year to 88,000.

Work on Oldsmobile $1,500,000 expansion program is progressing rapidly. An addition to the compression room, which will about double this department, is under way at a cost of approximately $18,000. The tool building is completed and the sheet metal building about finished. Work on the $250,000 axle plant is also progressing rapidly.

Link Belt on 50 Cars

CHICAGO, Dec. 18—Link-Belt Co. reports its timing chains as standard equipment on 50 automobile models; 25 automobile engines; 34 trucks; 14 marine engines and 10 buses. The company is building an addition to its Indianapolis plant to provide for a 25 per cent increase in floor space and capacity.

Lincoln Doubles Salon Sales

DETROIT, Dec. 17—Sales of Lincoln cars at the salon in New York exceeded by approximately 100 per cent the highest number of Lincoln sales obtained at any previous salon, according to a statement by Ford Motor Co.

Marmon to Speed Roosevelt Output

Will Put Production on 200 Daily Basis at Beginning of Operations

INDIANAPOLIS, Dec. 15—A car to sell for less than $1,000 will be introduced by Marmon Motor Car Co. in the early spring, G. M. Williams, president, has announced. The car will be known as the Roosevelt and will be in addition to the present Marmon line of eights, including the series 68 in the $1,500 price class and the 78 in the $2,000 field.

Although details of the new Roosevelt were not given out at this time, Mr. Williams said an extensive manufacturing program is being perfected for production in quantity in the early spring. He explained that the car will be manufactured entirely in Marmon factories, probably on a starting basis of 200 daily, in addition to the other two series which have averaged about 100 cars a day since their introduction.

Although it carries a different name, the Roosevelt will be sold through the Marmon dealer and distributor organization. By the time of the Roosevelt's introduction to the public, it is planned to have complete representation in all markets, however small.

In his statement regarding the new car, Mr. Williams said its design was the result of a long period of experimental work by the Marmon engineering staff, headed by Col. Howard Marmon, vice-president in charge of engineering, and Thomas J. Litle, Jr., chief engineer. He explained further that most of the factory equipment necessary in the production of the Roosevelt, already had been installed.

Oakland Production 11,969

PONTIAC, Dec. 17—Oakland Motor Car Co. reports sales of its Oakland in November as 10,511, the highest total for any month in the company's history and comparing with 4086 in November last year. Pontiac production was discontinued during the month to prepare for the 1929 model, only 1458 cars being shipped. The combined shipments of the two lines was 11,969. Total production of the two lines for the first 11 months of the year was 255,075, an increase of 63,109 over sales in the full year 1927.

Square D in Purchase Deal

DETROIT, Dec. 14—The Square D Co. of Detroit, manufacturer of electric switches, has practically completed negotiations for purchase of the Industrial Controller Co., Milwaukee, manufacturers of pressure switches and electrical controls of various kinds. Directors of both companies have approved the transaction which will be submitted to stockholders of the two companies shortly.

Steel Sales Drive Waits Year's Turn

Fair Volume of First-Quarter Contracts Reported for Some Descriptions

NEW YORK, Dec. 20 — The steel market is in a holiday mood. Price does not come in for very much discussion in what little first-quarter business comes to mills. Producers are apparently satisfied to give the demand an opportunity to develop and, until they have a better line on its extent, they will maintain a waiting attitude, booking what business comes to them of buyers' own volition at the regular going prices and refraining from more intensive sales efforts to fill their order books.

Announcement by the largest independent steel producer of bar and plate prices for first-quarter, reaffirming the previously known quotation of 1.90 cents, Pittsburgh, for large and of 2.00 cents for small buyers, is interpreted as denoting a policy of giving full publicity to price changes in the future. A fair volume of first-quarter contracts is coming to cold-bar finishing mills, buyers having nothing to gain by delaying commitments as the 2.20 cents price for cold-finished bars is firmly adhered to all around. Sheet mills are making heavy shipments against old price contracts.

Consumers are watching developments closely, and if they can lay their hands on any shipments at old prices after the turn of the year, it will be construed as indication that the higher prices have not become fully operative. There is renewed talk of advancing the price of sheet-bars from $34 to $35, so as to stiffen the attitude of non-integrated sheet-rollers.

Within the last few days, announcement has been made of two technical developments that may have an important bearing on production costs. One of these, a new process for annealing and pickling, is described as cutting down by one-half the time required for these finishing processes. The other, a process for making sponge iron or steel direct from the ore is reported to have been leased to the Ford Motor Co.

Pig Iron—The market has turned dull, most of the movement being made up of small lots. Blast furnace interests assert that melts by automotive foundries are well maintained, and that they have little iron on hand. For all that, some automotive foundries appear to be waiting for a turn in the market in consumers' favor.

Aluminum—Propaganda in Germany for lower prices continues, but there is no change in quotations reported in any of the world's markets. The latest gossip has it that the sole American producer, through adoption of a new metallurgical process in his Norwegian subsidiary plant, has attained production costs that cause other European producers considerable uneasiness. One direct result of this state of affairs may be that, if copper advances further, which would formerly have led to the stiffening of aluminum prices, the latter will remain unaffected. Remelted metal rules firm.

Copper—Some producers predict 17-cent copper early in 1929, basing their prophecies on what they characterize as a total lack of surplus. For the present the market rules firm and quiet.

Tin—Approach of the holidays causes a slower market pace, with prices fairly steady.

Lead—The market is quiet and steady.

Zinc—Curtailment of output by the European Cartel should have no influence on the American market, affecting only zinc smelted in the United States from Mexican ores in bond. Prices are unchanged.

League of Nations Road Traffic Committee Initiates Action to Aid Inter-Country Travel

PHILADELPHIA, Dec. 17—A meeting of the Permanent Committee for Road Traffic of the League of Nations took place in Paris, Nov. 13 to 17, which was attended also by representatives of the International Association of Recognized Automobile Clubs and of the International Touring Association.

A resolution was passed instructing the general secretary of the committee to submit to it as soon as possible a draft of an international convention concerning public carrier transport of persons and freight across international boundaries. The plan is to concede complete freedom of transit to vehicles of the types in question across such boundaries, the right being reserved to the individual governments to confine interior transports to vehicles approved by them. In addition each country will be at liberty to exact taxes from foreign motor transports passing through their territory. The general secretary is also requested to gather material concerning present regulations covering the subject and is instructed to ask the cooperation of the International Chamber of Commerce, the International Association of Recognized Automobile Clubs and the International Touring Association.

Another resolution was passed advocating a general agreement among countries to so formulate the rules regarding the taxation of non-resident motorists as to encourage international tourist traffic. The wishes of the two organizations represented at the meeting are to be taken into consideration in this connection, these including that no tax be levied on foreign motorists during the first two months of their stay, that with a view toward simplification, the taxes be levied when the motorist leaves the country. It was announced that quite a number of governments already had expressed their willingness to grant tax exemption to visiting motorists for fixed periods.

Tire Exports 1,924,600 in First Nine Months

WASHINGTON, Dec. 20—The automobile tires of the world are made principally in eight countries, according to a survey of the U. S. Department of Commerce. In the order named the eight are: United States, France, Canada, United Kingdom, Italy, Belgium, Japan and Germany. In the United States, at the present time, there are 125 establishments manufacturing tires and of this number but 15 are engaged in the export business to any extent.

Exports of automobile casings, the first nine months of this year, were 1,924,600, a margin of 593,200 over France, the United States' principal competitor. Canada, third ranking country, exported 1,214,100 casings.

Pioneer Instrument to Build

NEW YORK, Dec. 15—Pioneer Instrument Co. is planning the construction of a new building at a cost of $110,000 which will increase the present floor space for manufacturing equipment by 50 per cent and will also add to office facilities.

Fairchild 1929 Planes Range $4,250 to $18,900

NEW YORK, Dec. 15 — Fairchild Airplane Mfg. Corp. has announced a price schedule for three standard models which it will build during 1929. A two-passenger open cockpit plane model capable of flying at 105 m.p.h. and landing at 40 m.p.h. will sell at $4,250. The second, known as Model 41, a closed cabin plane carrying four passengers with standard equipment, will sell for $8,950, and the third, Model 71, a seven-passenger closed cabin plane, is priced at $18,900.

Moreland Aircraft Organized

LOS ANGELES, Dec. 17 — Moreland Aircraft, Inc., has been formed in Los Angeles as a closed corporation with a capital of $500,000 to manufacture airplanes. G. E. Moreland is president and general manager. Initial plans call for the production of a three place, open type, highwing monoplane with a cruising speed of 130 m.p.h. and a landing speed of 40 m.p.h. Production will start at the rate of one ship a day.

Rubber Shipments Increase

NEW YORK, Dec. 17 — The crude rubber market remained steady last week with routine trading and prices varying but little, according to F. R. Henderson Corp. Stocks in London were decreased to 16,517 tons with imports at New York during the first two weeks of December estimated at 9700 tons. Arrivals during the entire month were expected to be unusually heavy on account of the November shipments from Malaya following the final removal of export restrictions. It is estimated December arrivals will approximate 91,000 tons.

Tire Inventories Increase in October

NEW YORK, Dec. 18—Inventories of pneumatic casings and tubes showed a marked increase in October over September of this year and also over October, 1927, according to statistics just issued by the Rubber Association of America, Inc. The increase in inventory over September is due primarily to decrease in shipments, whereas the increase over October of a year ago is due wholly to a marked increase in production, although shipments increased over a year ago. The bulk of this increase is attributed to balloon casings and tubes in each instance. Production in October this year was nearly double that of October, 1927. Comparative figures follow:

	Inventory	Production	Shipments
Balloon Casings			
Oct. 1928....	5,767,229	3,443,334	2,668,049
Sept. 1928...	4,935,836	3,220,369	3,327,028
Oct. 1927....	3,764,591	1,683,003	1,809,385
Balloon Inner Tubes			
Oct. 1928....	6,938,958	2,727,943	2,365,093
Sept. 1928...	6,483,804	2,782,759	2,938,309
Oct. 1927...	4,965,306	1,415,650	1,607,119
High Pressure Cord Casings			
Oct. 1928....	2,834,193	2,035,898	1,596,081
Sept. 1928...	2,339,798	1,853,887	1,990,535
Oct. 1927....	3,920,601	1,830,171	1,710,288
High Pressure Inner Tubes			
Oct. 1928....	4,525,109	2,469,142	1,881,663
Sept. 1928...	3,673,789	2,544,561	2,427,444
Oct. 1927....	5,189,388	2,383,346	2,161,449

Langstroth Publicity Manager

The Rubber Association of America, Inc., has appointed Earl Langstroth as manager publicity department. Mr. Langstroth was formerly publicity manager of the New York Trust Co. Through this new department the association will cooperate with the press in the publication of facts, figures and articles of general interest concerning the rubber industry.

Richard J. Snowhook

KENOSHA, Dec. 18—Richard J. Snowhook, director of publicity for Nash Motor Co., died at his home here yesterday following an illness of several months. He was 46 years old. He began his newspaper career as a reporter for the Chicago Daily News. later served on the staffs of the Chronicle, Inter-Ocean and Record-Herald, and joined Nash in 1917.

Coming Feature Issue of Chilton Class Journal Publications

Feb. 23—Statistical Issue Automotive Industries.

Cadillac to Use Plane to Advertise Show Cars

NEW YORK, Dec. 15—Decoration of Grand Central Palace for the national automobile show has already started, the shop equipment and accessory sections now being given decorative treatment. Some of the outside attractions planned by exhibitors this year for advertising show exhibits are unique. Cadillac Motor Car Co. is planning to use a large airplane under the wings of which will be written in Neon lights, with letters 6 ft. high, an announcement that these cars can be seen at the show.

Eight more concerns were added to the list of accessory exhibitors last week. For New York: Crowner Co., Inc., New York City, and Doering Spark Plug Co., Newark, N. J. For Chicago; J. W. Beamer & Co., Chicago; Sieg-Warford Co., Chicago; Alemite Mfg. Corp., Chicago; A-C Brake & Supply Co., Chicago; Crowe Name Plate & Mfg. Co., Chicago, and the Sanlo Mfg. Co., Brooklyn, N. Y.

Builds Hundredth Plane

ST. LOUIS, Dec. 20—The hundredth "Curtiss-Robin" was turned out at the Curtiss-Robertson Airplane Mfg. Co., at Lambert-St. Louis Field today. The factory has been in operation since May and production has been stepped up to a schedule of 11 planes a week. The "Robin," a cabin monoplane, sells for $4,000. Officials of the company have announced that beginning in January, a number of "Robins" will be equipped with the new Curtiss Challenger engine, increasing the cost of the plane.

Goodyear to Build in South

AKRON, Dec. 15—Goodyear Tire & Rubber Co. will erect a plant near Gadsden, Ala., the first unit to cost $10,000,000 and to be equipped to build 5000 tires daily by mid-summer.

Aeronautic Chamber Forms New Sections

NEW YORK, Dec. 18—The Aeronautical Chamber of Commerce of America has formed two new sections. One of these, under the management-ship of Frank J. Shipman of the Texas Co., is to study and standardize tests for fuels and lubricating oils for aircraft engines.

This section will make a study of all lubricating oils with respect to their utility for aircraft engines and will standardize these oils on the basis of qualities demanded in these engines. Another problem which will engage the attention of this section is that of making available for pilots all over the country such supplies of high compression gas as they may need.

The other recently organized section, under the chairmanship of C. S. Jones of Curtiss Flying Service, will work on drafting a set of standards for flying schools.

C. L. Derrickson

ST. LOUIS, Dec. 17—C. L. Derrickson, vice-president of the McQuay-Norris Mfg. Co., died Dec. 13 following a long illness. For the past few years he had been active head of the McQuay-Norris sales force and was a widely known figure in the automotive Equipment Association. He at one time covered the entire United States for the company and was widely known in the distributing field.

Abrasive Holds Conference

PHILADELPHIA, Dec. 15—The Abrasive Co. held a sales conference at its factory and at the Penn A. C. early this month under the direction of S. M. Hershey, sales manager. Features were plant inspection, a review of new factory and process development and a grinding description in the Abrasive mechanical laboratory.

Bean Builds Warehouse

DETROIT, Dec. 17—The Bean Spray Pump Co. of Lansing, manufacturer of spray pumps and other machinery, is expending approximately $75,000 in an expansion program, which includes the erection of a new warehouse, costing about $35,000.

Calendar of Coming Events

SHOWS

All-American Aircraft Show, Detroit Board of Commerce, Detroit..Apr. 6-14
American Road Builders Association, Inc., Cleveland Auditorium..Jan. 14-18
Amsterdam Automobile Show....Jan. 11-20
Automobile Salon, Inc., Hotel Drake, Chicago .....Jan. 26-Feb. 2
Automobile Salon, Inc., Hotel Biltmore, Los Angeles.....Feb. 9-16
Automobile Salon, Inc., Palace Hotel, San Francisco .....Feb. 23-Mar. 2
Boston, Mass., Mechanics Bldg...March 2-9
*Chicago, National, Coliseum, Jan. 26-Feb. 2

* Will have special shop equipment exhibit.

Geneva Automobile Show .....Mar. 15-24
Leipzig, Germany, Fair.....Mar. 3-13
Melbourne Automobile Show.....May 2-11
*New York, National, Grand Central Palace .....Jan. 5-12
Rome Automobile Show.....Jan. 30-Feb. 16
Western States Metal and Machinery Exposition, Los Angeles.....Jan. 14-18

CONVENTIONS

American Road Builders Ass'n, Inc., Cleveland Auditorium.....Jan. 14-18
American Society for Steel Treating, Semi-Annual Meeting, Los Angeles .....Jan. 14-18
Chicago Power Exhibition and Conference, Coliseum, Chicago....Feb. 12-16
Manufacturers & Distributors of Motor Truck Equipment, Cleveland, Ohio .....Jan. 15
National Automobile Dealers Association, Palmer House, Chicago..Jan. 28-29
National Metal Congress, Los Angeles, Jan. 14-18

S. A. E. National

Detroit, Book-Cadillac, Jan. 15-18—Annual.
New York, Hotel Astor, Jan. 10—Annual Dinner.